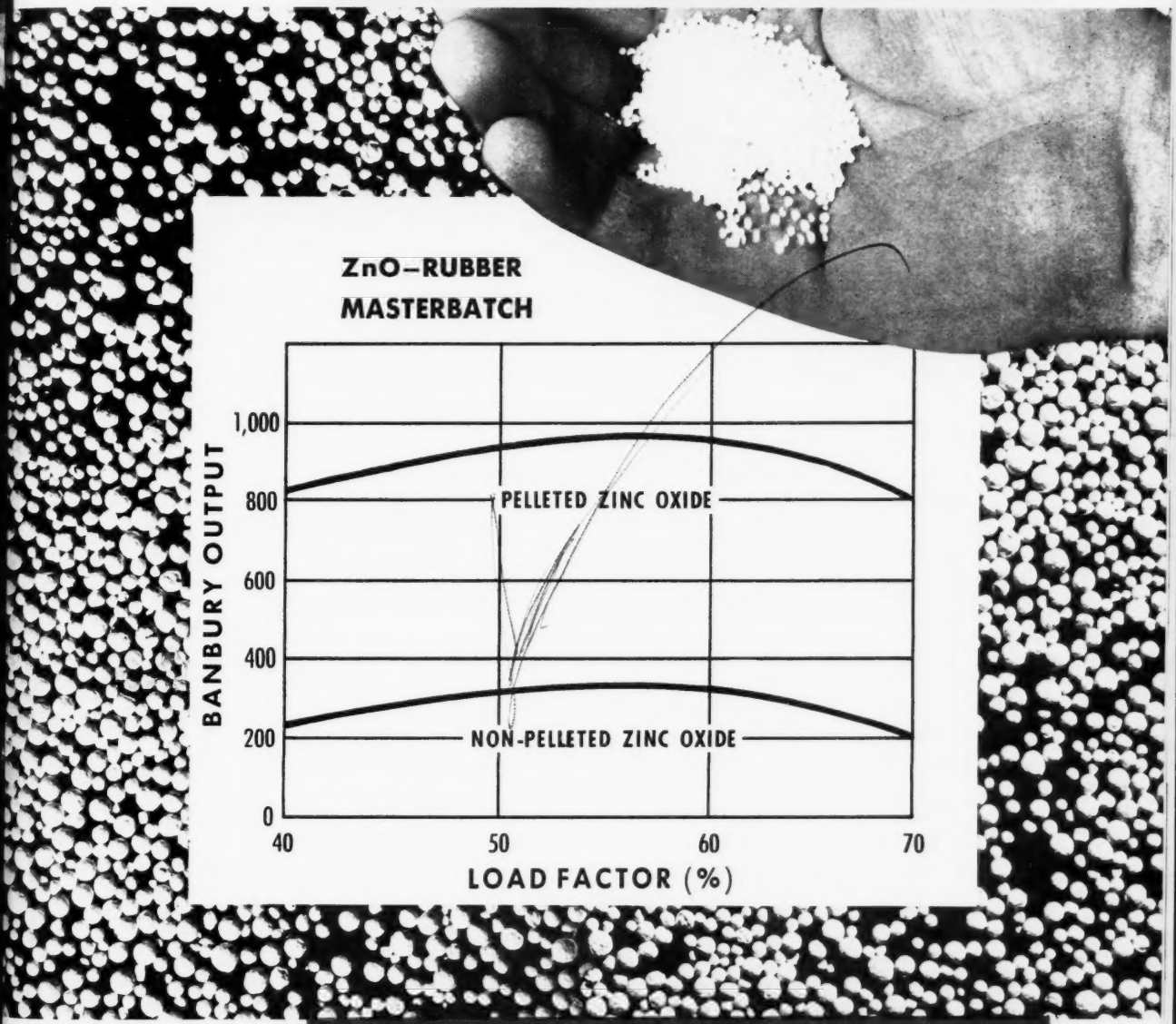
TECHNOLOGY DEPT.

EBRUARY, 1956

RUBBER WORLD

PUBLIC LIBRARY
FEB 2 1956
DETROIT

NOW IN ITS 67th YEAR



BANBURY OUTPUT INCREASED WITH PELLETED ZINC OXIDE

See article by Jones and Snyder, page 651

Contents, page 647

A BILL BROTHERS
PUBLICATION

An anti-degradant for neoprene, natural rubber and GR-S

PERMALUX®

IN RUBBER OR GR-S

"Permalux" is a good non-discoloring anti-oxidant

- **DOES NOT CAUSE YELLOWING**
- **LIGHT EXPOSURE CAUSES ONLY SLIGHT GRAYISH TINGE**

IN NEOPRENE

"Permalux" is a fast-curing accelerator

"Permalux" has been used in these dual roles for many years

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division
DISTRICT OFFICES:

Akron 8, Ohio, 40 E. Buchtel Ave.	POrtage 2-8461
Atlanta, Ga., 1261 Spring St., N. W.	EMerson 5391
Boston 10, Mass., 140 Federal St.	HAncock 6-1711
Charlotte 2, N. C., 427 West Fourth St.	FRanklin 5-5561
Chicago 3, Ill., 7 South Dearborn St.	ANdover 3-7000
Detroit 35, Mich., 13000 West 7-Mile Rd.	UNiversity 4-1963
Houston 25, Texas, 1100 E. Holcombe Blvd.	JAckson 8-1432
Los Angeles 58, Calif., 2930 E. 44th St.	LOgan 5-6464
Trenton 8, N. J., 1750 North Olden Ave.	EXport 3-7141

In Canada contact Du Pont Company of Canada Limited, Box 660, Montreal

Du Pont
RUBBER CHEMICALS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

RUBBER WORLD, February, 1956, Vol. 133, No. 5. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 1309 Noble Street, Philadelphia, Pa., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States $5.00 per year; Canada, $6.00; All other countries $7.00. Single Copies 50 cents. Address Mail to N. Y. Office.

Another new development using

B. F. Goodrich Chemical *raw materials*

Ames Rubber Company, Hamburg, New Jersey makes the platen for Calculagraph Company, Harrison, New Jersey. B. F. Goodrich Chemical Company manufactures the Hycar American rubber only.

Time marches onto printed cards... with Hycar

HERE is a new automatic elapsed time recorder for use in parking lots, long distance switchboards —anywhere in industry where precise timing must be recorded on cards. It also computes time intervals.

There are many good reasons why the manufacturer selected Hycar American rubber for the printing platen. The platen needed to be soft enough to "give" under the impression, yet hard enough for a clear print. It had to be springy so no permanent impressions remained. And most important it could not swell or be attacked by the solvents in the ink. The manufacturer found that Hycar gave the exact combination of properties required.

Hycar American rubber has exceptional resistance to abrasion, oil, gas, heat and cold, as well as many chemicals. Throughout industry Hycar has solved many problems and improved many operations. It may supply the answer to your own product problems. Please write Dept. ET-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U.S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Use the right PHILBLACK® in your rubber recipes!

There are four Philblacks to choose from – just tell us your specific needs. Resilience . . . abrasion resistance . . . low heat buildup . . . high hot tensile? The right Philblack in your recipe can help you achieve these *and many other* desirable characteristics in your finished product.

Manufacturers of rubber products are invited to use Phillips technical sales service facilities for assistance in solving processing problems, too. Phillips practical experience with rubber and carbon black goes a long way back. Continuing research over a period of years has given Phillips a position of authority in this field.

Make full use of this valuable scientific data on rubber compounding and performance. For further information on how *you* can benefit by using Philblack, consult our technical representative.

Meet the Philblacks! KNOW WHAT THEY'LL DO FOR YOU!

Philblack A FEF Fast Extrusion Furnace Black
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

Philblack I ISAF Intermediate Super Abrasion Furnace Black
Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

Philblack O HAF High Abrasion Furnace Black
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

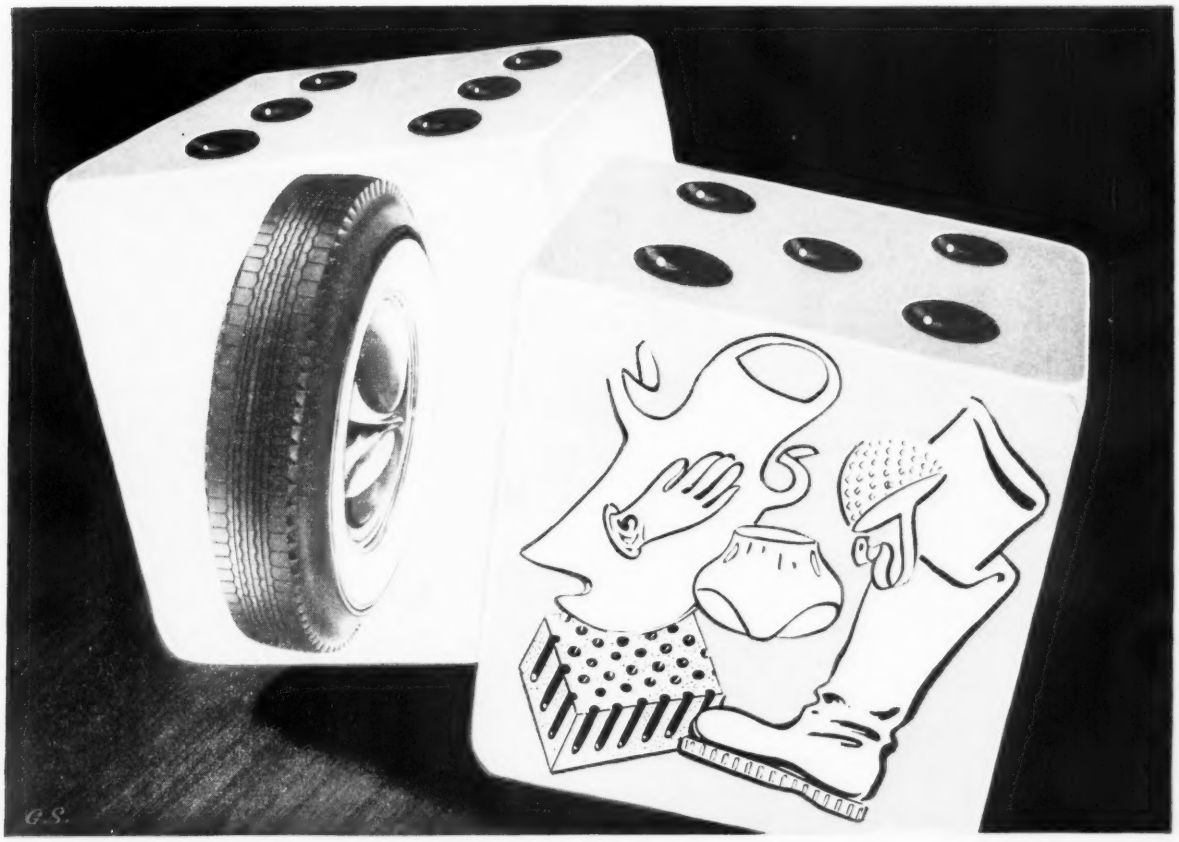
Philblack E SAF Super Abrasion Furnace Black
Toughest black on the market. Extreme abrasion resistance. Withstands aging, cracking, cutting and chipping.

PHILLIPS CHEMICAL COMPANY, Rubber Chemicals Division, 318 Water St., Akron 8, Ohio. Export Sales: 80 Broadway, New York 5, N. Y.
West Coast: Harwick Standard Chemical Company, Los Angeles, California.

POLYGARD

chemical stabilizer for GR-S

A NATURAL...



for keeping White rubber **WHITE** • Light rubber **LIGHT**

POLYGARD® is a chemical stabilizer for *nonstaining* and *nondiscoloring* GR-S. It *keeps* light rubber light —gives *superior* color stability to your product.

Specifically designed to prevent staining and discoloring, POLYGARD gives excellent resistance to aging. It also prevents viscosity changes and gel increase during drying and high temperature processing.

POLYGARD stabilized polymers are used for whitewall tires, shoe soling, tiling, hospital sheeting, sponge rubber, wire insulation, and many other products. Since POLYGARD stabilized GR-S rubber is fully equivalent to staining type GR-S you can *now* use nonstaining GR-S in both white and black sidewall tires as well as in other products across the board.

SEE – Naugatuck Chemical Division, United States Rubber Company, at work on NBC's "Color Spread" TV spectacular, Sunday, March 25, 7:30 PM, EST.

NAUGATUCK

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

US RUBBER

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company, Limited, Elmira, Ontario

RUBBER CHEMICALS • SYNTHETIC RUBBER • PLASTICS • AGRICULTURAL CHEMICALS • RECLAIMED RUBBER • LATICES • Cable Address: Rubexport, N.Y.

a case of jointe

A string of hundreds of joints of drill pipe is as flexible as a fine steel wire. If uncontrolled, it rubs and slams against the casing–causes costly, premature wear and damage.

To protect their investment in pipe, casing and tool joints, drillers first placed tough, thick collars of natural rubber at intervals on the pipe. These served as efficient spacers and protectors despite the extreme abuse and abrasion.

But the advent of oil-based drilling muds brought a new problem: The natural rubber quickly swelled and deteriorated.

To meet this new service requirement, an enterprising specialty molding company, working jointly with all concerned, developed a new compound based on CHEMIGUM–the easy processing nitrile rubber.

The excellent oil-resistance of CHEMIGUM plus its ability to be cured without sulfur made possible an "all-purpose" protector which: 1. Effectively resists the chemical and abrasive attack of both oil- and clay-base drilling fluids. 2. Exhibits minimum oil-absorption characteristics. 3. Resists the effects of high temperatures more than any other protector on the market. 4. Displays the high tensile and pipe-gripping qualities of natural rubber. 5. Is well lubricated by both types of mud.

The easy processing of CHEMIGUM, its lightweight bale and its excellent bin aging properties also were pleasing to the molder.

Drill pipe protectors are another example of how the extra oil-resistance and extra processability of CHEMIGUM have materially improved a product. How can they help yours? For details and the latest Tech Book Bulletin, write:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

RUBBER & RUBBER CHEMICALS DEPARTMENT

CHEMIGUM • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemigum, Pliodex, Pliolite, Plio-Tuf, Pliovic–T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

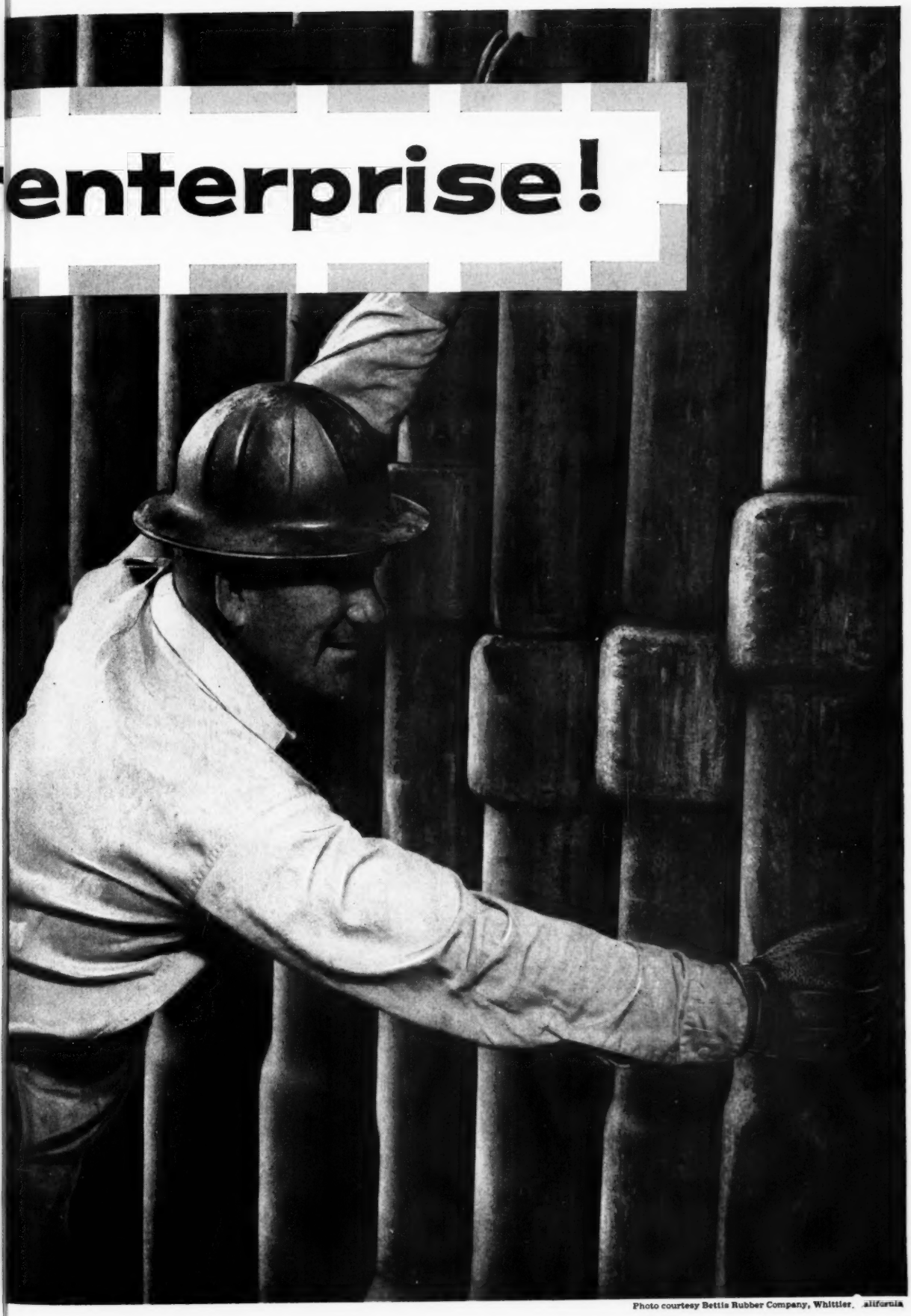
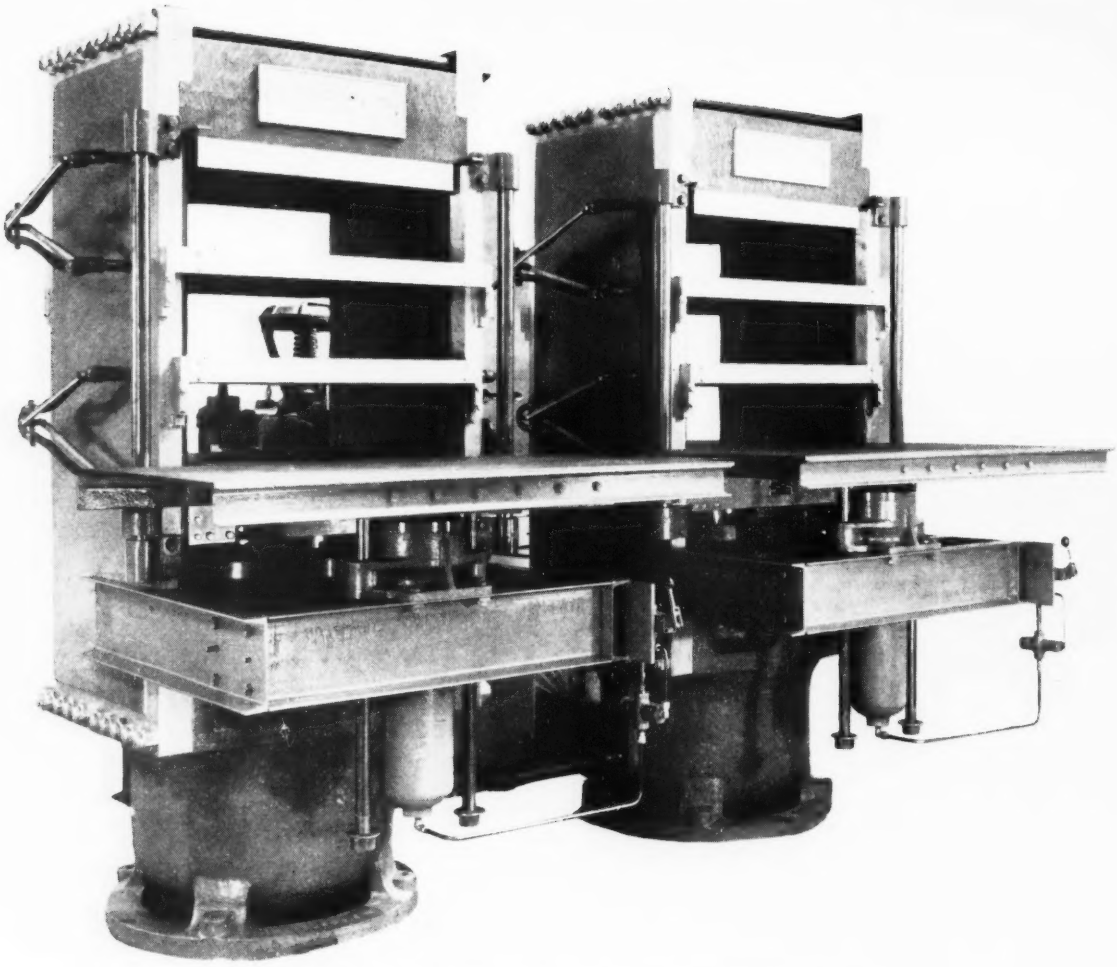


Photo courtesy Bettis Rubber Company, Whittier, alifornia



Two 452-Ton Hot-Plate Presses, Three 8" Openings
With Hydraulically-Raised Loading Platforms.

FRENCH

SIDE-PLATE PRESSES

THE STANDARD FOR RUBBER MOLDING

FRENCH PATENTED FEATURES ASSURE
THE STURDIEST, MOST RIGID, PRESS AVAILABLE!

YOU CAN

REDUCE MOLD MAINTENANCE!
IMPROVE CLOSE TOLERANCE MOLDING

SEND FOR ILLUSTRATED CATALOG

THE FRENCH OIL MILL MACHINERY CO.
(HYDRAULIC PRESS DIVISION)
1011 GREENE ST. PIQUA, OHIO

for the BEST...
in rubber and plastics
LOOK TO MUEHLSTEIN
For example—PLASTICS
POLYSTYRENE—We process it, custom color it, and regrind it to your specifications. In addition we buy and sell all grades of general purpose Polystyrene.
POLYETHYLENE—Why gamble when we guarantee the material! We process Polyethylene, regrind it and custom-color it to your exact specifications.
VINYL—Whether you calender film, sheeting or flooring—extrude hose, tubing, spline, channel, mold toys or novelties—coat paper or fabrics—Muehlstein has a Vinyl raw-material for you. We convert your scrap into pellets, granules, slabs or dollars.
We can also solve your problems on cellulose acetate, cellulose acetate butyrate, ethyl-cellulose, acrylics, and any other thermoplastic material. If you have a special problem, take advantage of our knowledge, technical "know-how" and our up-to-date laboratories.
H. MUEHLSTEIN & CO. INC.
60 EAST 42nd STREET, NEW YORK 17, N. Y.
CRUDE RUBBER • SYNTHETIC RUBBER • SCRAP RUBBER • HARD RUBBER DUST • PLASTIC SCR
REGIONAL OFFICES: Akron • Chicago • Boston • Los Angeles • London • Toronto
WAREHOUSES: Akron • Chicago • Boston • Los Angeles • Jersey City

Order a shipment of

WITCO-CONTINENTAL

CARBON BLACK

on expendable pallets

WITCO

36 Years of Growth

WITCO CHEMICAL COMPANY

CONTINENTAL CARBON COMPANY

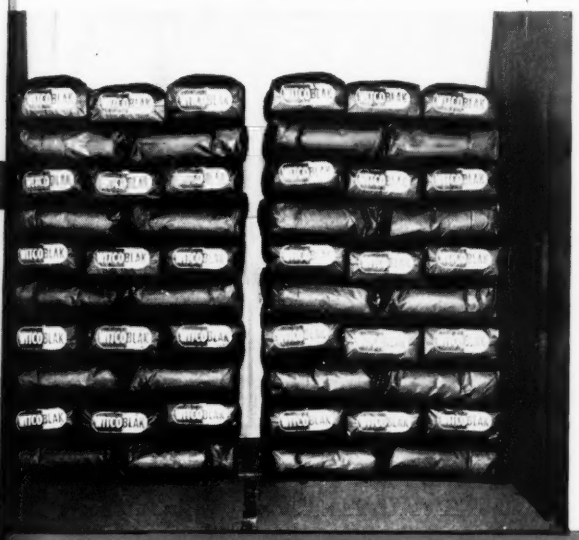
122 East 42nd Street, New York 17, N.Y.

CHICAGO • BOSTON • AKRON • ATLANTA • HOUSTON • AMARILLO • LOS ANGELES

SAN FRANCISCO • LONDON AND MANCHESTER, ENGLAND

Witco-Continental pioneered palletized carbon black shipments. Shipped by rail or truck, palletizing saves you time and money in carbon black handling.

Palletized shipments are loaded and unloaded in minutes rather than hours. Engineered stacking patterns assure smooth riding, optimum freight rates and undamaged delivery.

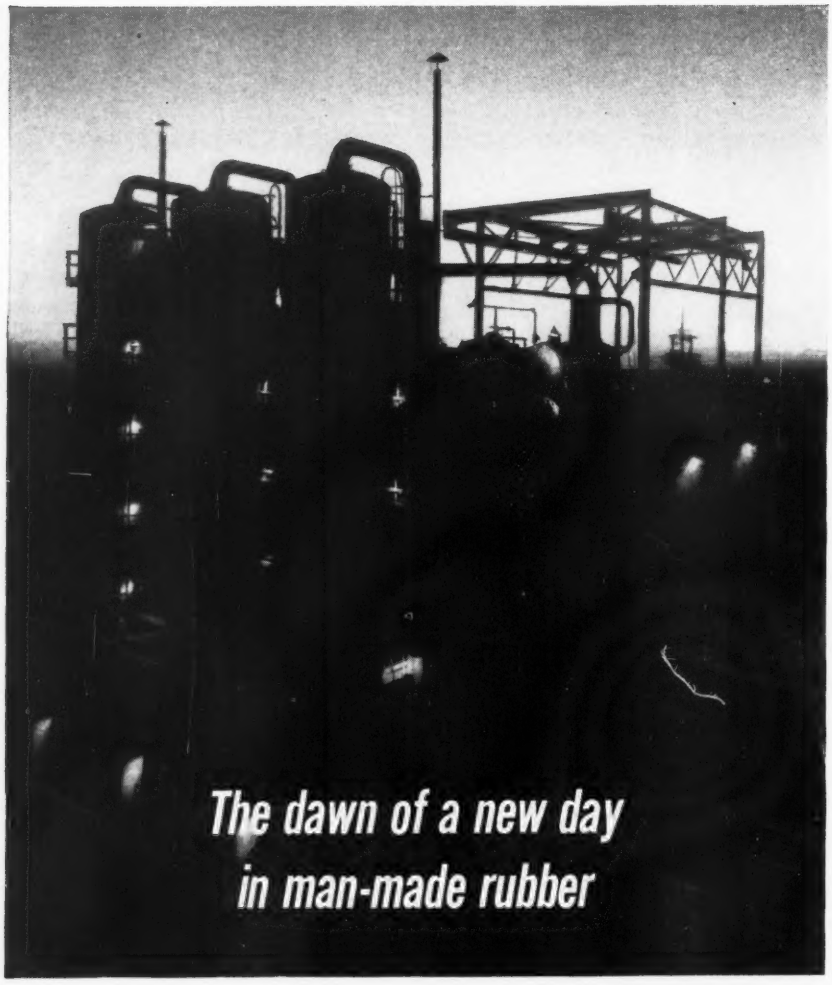


Palletized loads can be picked up, carried and placed, all by fork lift truck. Load lock adhesive on each bag keeps stacks firm and neat, increases handling safety and speed.

Palletized loads can be stacked in your warehouse, two-high, with ease. You save valuable storage space and materials-handling manpower. Order from Witco-Continental today and save.

Witco—Continental packaging and materials-handling engineers are available for consultation on any specific problem in the further development of materials-handling technique.

Goodrich-Gulf Chemicals, Inc.



Out of the giant plants of Goodrich-Gulf in Port Neches, Texas come tons and tons of Ameripol rubber, the quality product that is backed by years of experience and a continuous research program. Ameripol meets the high standard of industry because the know-how is there.

Expansion of Goodrich-Gulf facilities assures industry of a rubber supply to meet its expanding needs.

A FAMOUS NAME...
AN ESTABLISHED
PRODUCT

Ameripol
REG. U. S. PAT. OFF.
RUBBER

Cold Non-Oil Polymers
•
Cold Oil Masterbatch Polymers
•
Hot Non-Oil Polymers

Goodrich-Gulf Chemicals, Inc.

3121 Euclid Avenue • Cleveland 15, Ohio

THE NAME TO REMEMBER FOR QUALITY BACKED BY YEARS OF RESEARCH AND EXPERIENCE

for new equipment, spares or replacements . . .

UNITED *Service-Proved* CRACKER ROLLS

THERE IS A

UNITED® *service-proved* ROLL

FOR EVERY
- **RUBBER**
- **PLASTICS**
- **LINOLEUM**
- **TILE**
- **PAINT**
- **OR OTHER**

NON-METALLIC *PROCESSING REQUIREMENT*

When you specify UNITED ROLLS, your complete satisfaction is guaranteed by over 50 years' experience in the design and manufacture of rolls for practically every type of rolling application. Precision engineered to the specific requirement of the individual machine or equipment in which they are to be used, UNITED *Service-Proved* ROLLS are in use the world over by processors of rubber, plastics, linoleum, paper, paint and scores of other metallic and non-metallic substances.

Specify UNITED ROLLS for new equipment, spares or replacements. The experience and advice of our rolls engineers is available without obligation.

UNITED® ENGINEERING AND FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

Plants at • Pittsburgh • Vandergrift • Youngstown • Canton • Wilmington (Lobdell United Division)

SUBSIDIARIES: Adamson United Company, Akron, Ohio
Stedman Foundry and Machine Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Non-Ferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

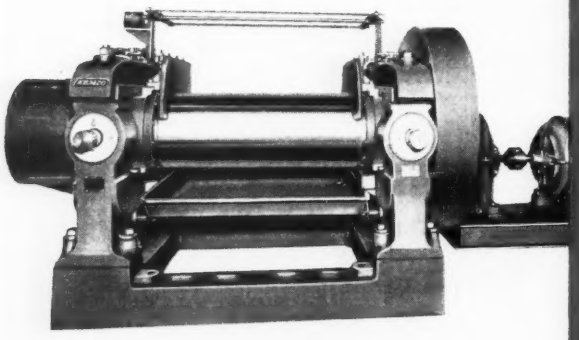
Consult ERIE ENGINE & MFG. CO.

for prices and delivery

MILLS • •

for the RUBBER and PLASTICS INDUSTRIES

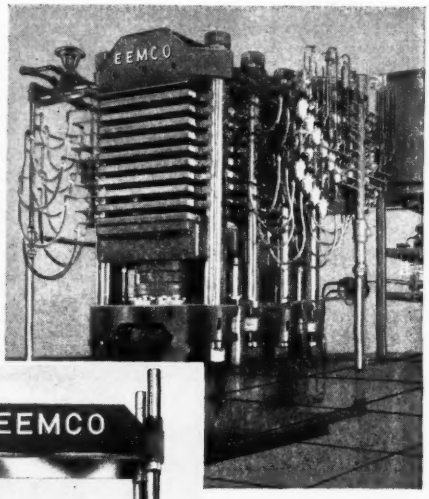
EEMCO mills for mixing and compounding rubber and plastics are available in all sizes from laboratory mills up to and including 84" mills in standard or custom units.



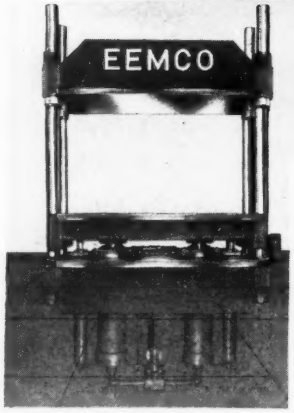
HYDRAULIC • • PRESSES

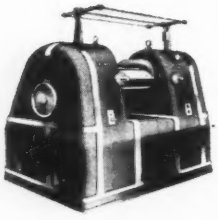
for RUBBER and PLASTICS PROCESSING REINFORCED PLASTICS MOLDING

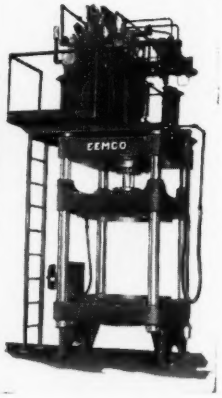
EEMCO heavy duty hydraulic presses are also available in a complete range of sizes from the 12" x 12" 42 ton laboratory press up to any size required. EEMCO designs and builds special presses to meet the customer's requirements.



EEMCO furnishes complete installations for reinforced plastics molding—presses, hydraulic units, preform machines, roving cutters and ovens.





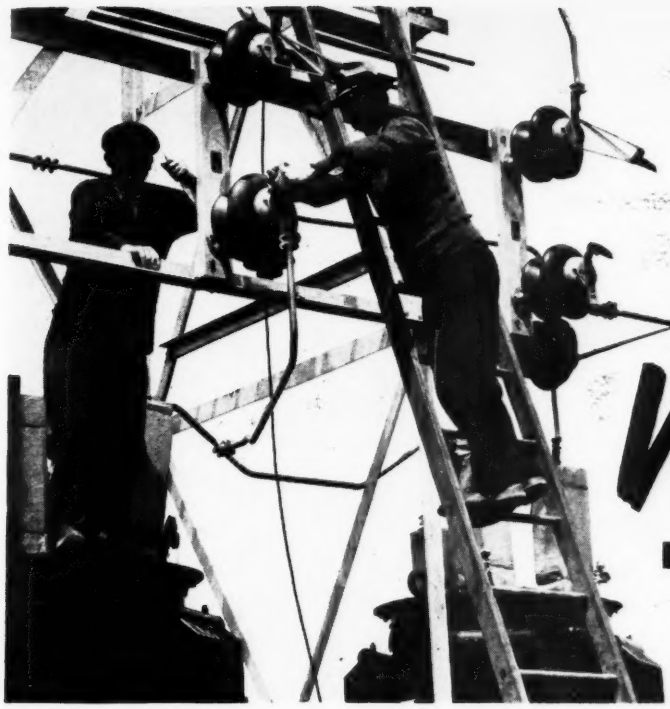


Call or write us for complete details. We will be glad to discuss your "Mill and Press problems"—of course, at no obligation to yourself.

EEMCO **ERIE ENGINE & MFG. CO.**

12th STREET and EAST AVENUE • ERIE, PA.

MILLS • PRESSES • LOADERS • LIFT TABLES • PLATENS • PREFORM MACHINES • ROVING CUTTERS



HIGH VOLTAGE performance!

NEW

Marbon "8000-AE"®

Reinforcing High Styrene Resin

for shrink-free processing of electrical insulations, jackets and sheet stock

You can depend on Marbon 8000-AE for fast mixing; smooth, easy extrusion and shrink-free calendering of electrical insulations, jackets and sheet stock. Marbon 8000-AE is the superior electrical grade resin with all the reinforcing properties of Marbon 8000-A.

- FOR SUPERIOR ELECTRICAL PROPERTIES
- LESS SCORCH
- INCREASED TOUGHNESS
- GREATER TEAR-RESISTANCE

GET THE FACTS — *Write* TODAY for complete TECHNICAL LITERATURE

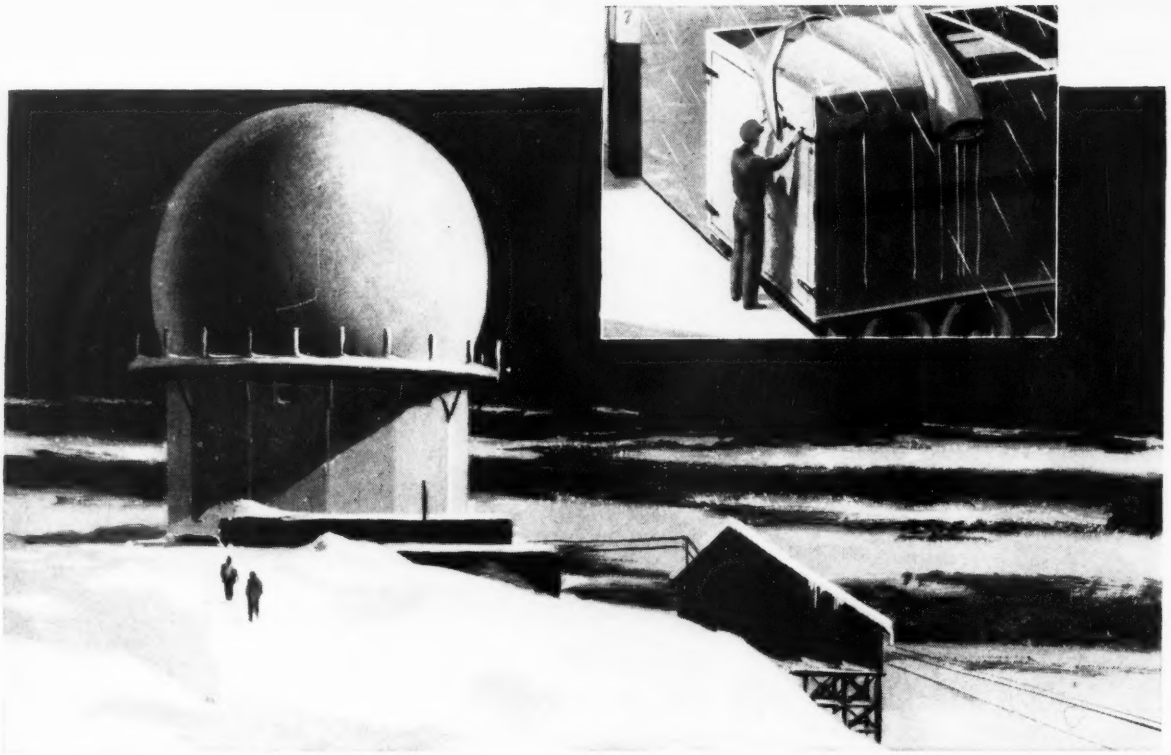
Marbon®

MARBON CHEMICAL

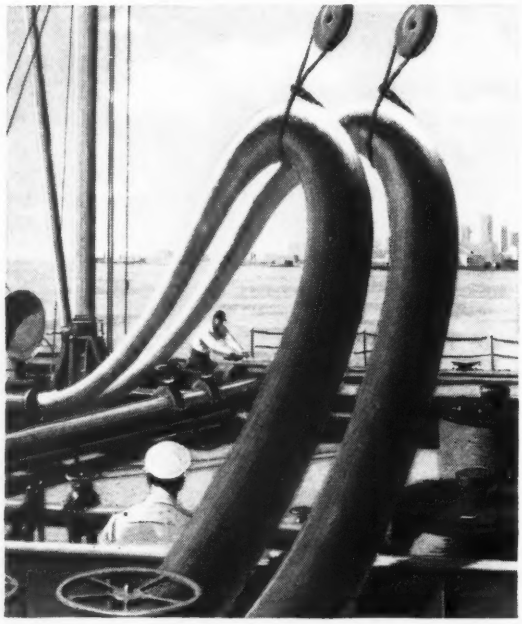
Division of BORG-WARNER

GARY, INDIANA

MARBON . . . . *It BLENDS as it STRENGTHENS as it IMPROVES*



Is the reinforcing fabric you use *ENGINEERED* to do the job?



Maybe you may never have to produce a finished product which must stand up under high pressure or severe weather conditions. But whether the specifications call for strength, flexibility, resistance to weather or any other qualities, there's no escaping one fact: a rubberized or coated fabric will perform as promised *on* the job only if the base fabric itself has been engineered to *do* the job, by the people who make it for you.

When you use a Wellington Sears base fabric, you know every on-the-job need has been considered and met – with plenty to spare – because we've been engineering fabrics for industry for more than a century. And it's this experience that pays off for you, in your finished product.

Whether it's a base fabric for pressurized radomes, for industrial hoses, for vinyl or neoprene coated tarpaulins, for vinyl auto and furniture upholstery or for any rubberizing or coating use, call on Wellington Sears – for the *fabric engineering experience* it takes to help you solve your specific problem.

For informative booklet, "Modern Textiles for Industry," write Dept. H2.

Wellington Sears

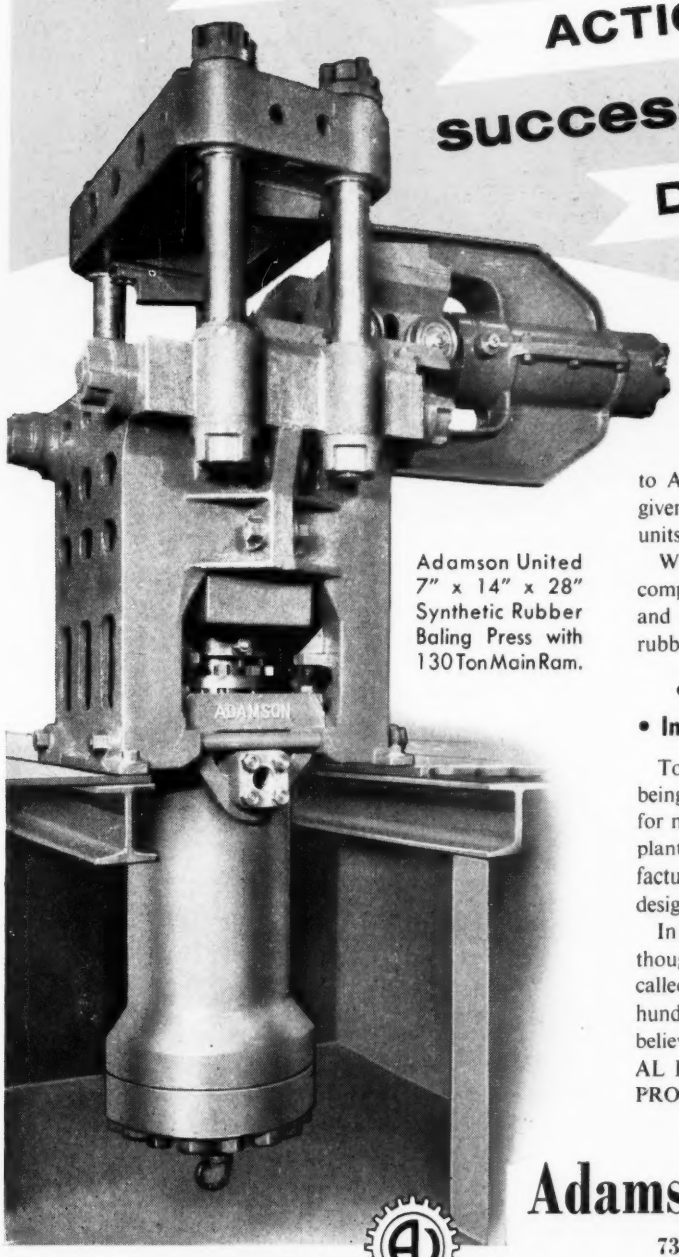
A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

For mechanical goods, coated materials, tires, footwear and other rubber products.

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

IDEAS
ACTION
successful product
DEVELOPMENT



Adamson United 7" x 14" x 28" Synthetic Rubber Baling Press with 130 Ton Main Ram.

When war forced our Government to produce synthetic rubber in great quantities, the acceptance of the challenge by American industry was a tribute to American engineering genius. In 1942, Adamson was given the assignment of developing and producing baling units which would handle the job efficiently—accurately.

Within approximately twenty weeks designs had been completed, patterns made, material collected and fabricated, and our first baling presses shipped to various synthetic rubber plants.

- **No time for Prototype Machines or try-out**
- **Immediate production was demanded and provided**

Today, those presses are in successful operation, and are being reproduced in quantities to handle 1955 requirements for nearly all of the large, synthetic-rubber manufacturing plants in the United States and Canada. European manufacturers are building their own to the original Adamson design.

In today's presses, no change in design is required, although, of necessity, these same baling units have been called upon to increase productivity by two and even three-hundred percent of the original estimated capacity. We believe that this is an outstanding example of FUNCTIONAL DESIGN WITH PROVISIONS FOR INCREASED PRODUCTION DEMANDS.

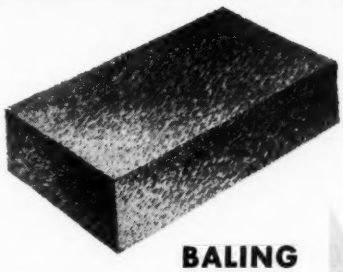
Adamson United Company

730 Carrol Street • Akron 4, Ohio

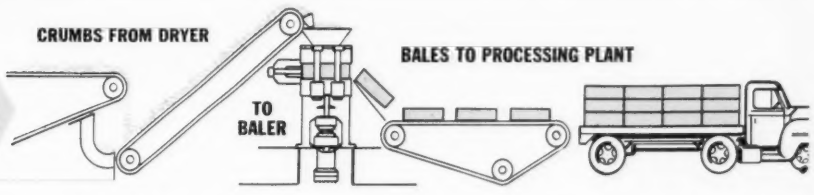
SALES OFFICES IN PRINCIPAL CITIES

Subsidiary of United Engineering and Foundry Company

Plants at: PITTSBURGH • VANDERGRIFT • YOUNGSTOWN • CANTON • WILMINGTON (Lobdell United Division)

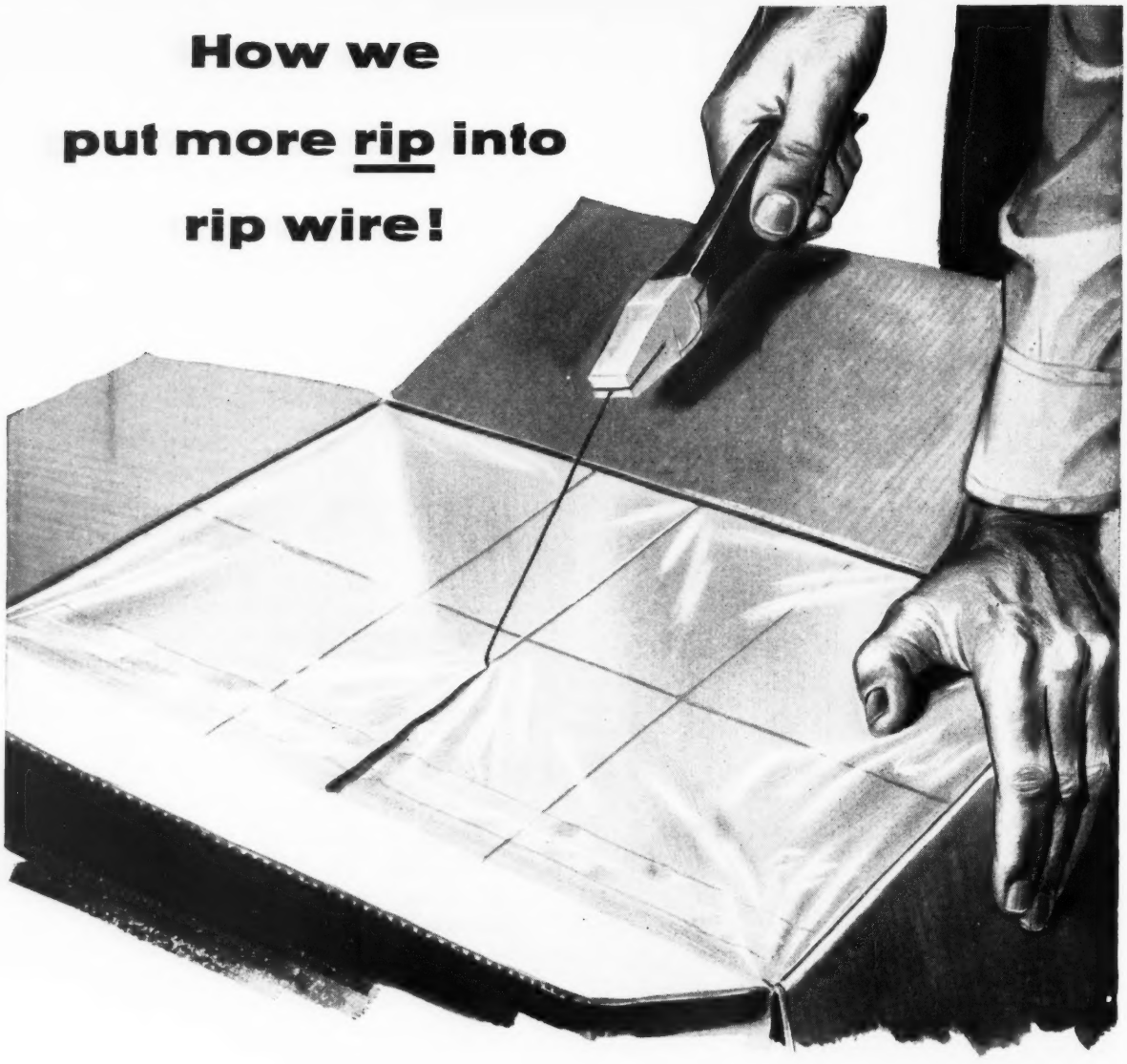


BALING SYNTHETIC RUBBER



DESIGNERS AND BUILDERS OF BETTER MACHINES AND PROCESSES FOR BETTER RUBBER AND PLASTICS PRODUCTS

How we put more rip into rip wire!



● Industry often wraps its products in heavy paper to protect it from damage due to moisture, handling and other causes. To make these packages or bundles easier to open, *Worcester Wire Works* has developed a special rip wire for inclusion in the wrapping.

To get even greater protection, some products are wrapped in plastics rather than paper. And this caused a problem. Ordinary rip wire wouldn't cut the tough plastic.

Our *Worcester Wire Works Division* solved the problem by developing a special rip wire with a knurled surface that literally put teeth into the wire. It cuts through the toughest plastic coating as easily as a buzz saw.

Not all of the problems we solve for industry have such simple solutions. Often, we are called upon to develop steel and wire with completely new characteristics . . . to combine seemingly incompatible factors or properties. And quite frequently these are developments that other manufacturers have given up on.

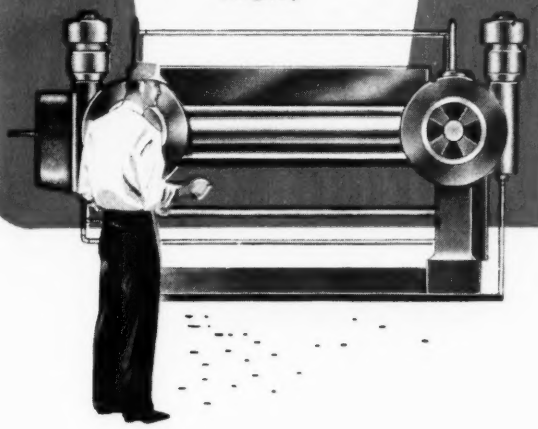
If you have a problem calling for special development work in steel or wire . . . either in creating a product or finding new and better ways to make or use it . . . it will pay you to write or call National-Standard.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
Tire Wire, Stainless, Fabricated Braids and Tape
ATHENIA STEEL DIVISION • CLIFTON, N. J.
Flat, High Carbon, Cold Rolled Spring Steel
REYNOLDS WIRE DIVISION • DIXON, ILLINOIS
Industrial Wire Cloth
WAGNER LITHO MACHINERY DIVISION • JERSEY CITY, N. J.
Special Machinery for Metal Decorating
WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
Round and Shaped Steel Wire, Small Sizes

Improved Qualities start here-

for Cost-minded Production men!



POLYCIZERS

for Every Purpose -

★ *to Aid Processing*

★ *to Improve Properties*

★ *to Gain Economies*

POLYCIZER DOS — Dioctyl Sebacate

POLYCIZER DBS — Dibutyl Sebacate

POLYCIZER DBP — Dibutyl Phthalate

POLYCIZER 162 — Dioctyl Phthalate

POLYCIZER 332 — Dioctyl Adipate

POLYCIZER 532 — Octyl Decyl Adipate

POLYCIZER 562 — Octyl Decyl Phthalate

POLYCIZER 632 — Didecyl Adipate

POLYCIZER 662 — Didecyl Phthalate

COLORS:

STAN-TONE MBS MASTERBATCH . . . For use in rubber and vinyl.

STAN-TONE PC — paste for plastisols and preblends.

STAN-TONE DRY — All types.

STAN-TONE GPE — Ground polyethylene dispersion compatible with rubber, vinyl and polyethylene.

STABILIZERS

STABELAN HR-50 — (Fluid Paste) For all Plastisol formulations. Contains plasticizer in addition to cadmium and barium with synergized chelating agent.

STABELAN HR — PASTE . . . "Single Package" stabilizer with cadmium and barium and synergized chelating agent.

STABELAN HR — LIQUID . . Synergized chelating agent.

STABELAN HR — POWDER . . . Metal bearing components of STABELAN HR Paste.

* Registered U. S. Patent Office

Here are vital components of many of your compounding needs . . . POLYCIZERS for your Plasticizer needs to give important improvements to your products — and to contribute essential economies in your production program . . . Colors for all types of products that stimulate product acceptance . . . And Stabilizers that add much to the workability of your compounds, and that contribute to greater life in service of the finished products. Write for complete data on these important compounding materials.

HARWICK STANDARD CHEMICAL CO.

60 South Seiberling Street, Akron 5, Ohio

Boston 16, Mass.	Trenton 9, New Jersey	Chicago 25, Illinois	Los Angeles 21, Calif.	Albertville (Ala.)
661 Boylston Street	2595 E. State Street	2724 W Lawrence Ave.	1248 Wholesale Street	Old Guntersville Hwy.

GEN-TAC®

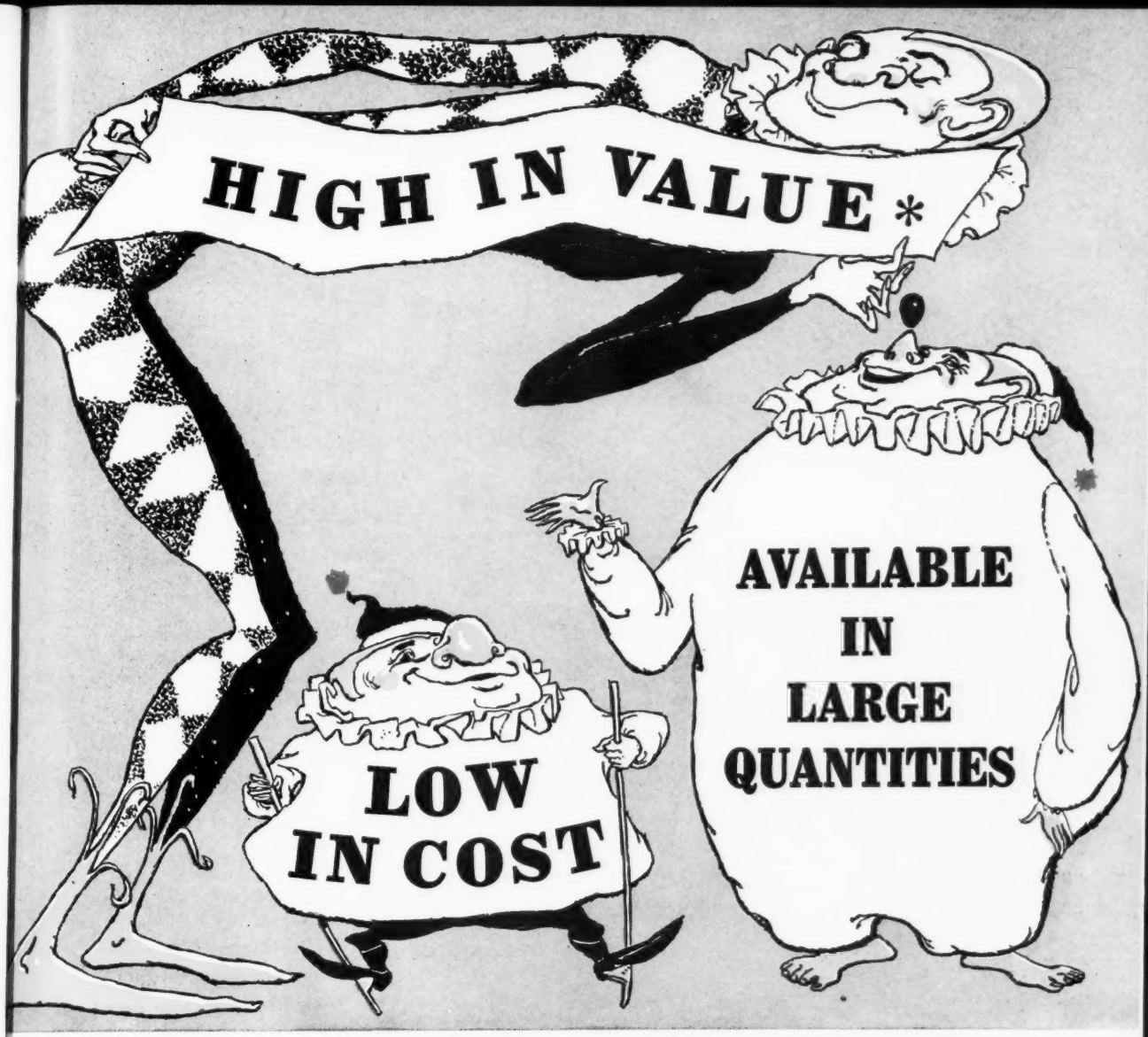
helps to prevent "Curing Blows" like this!

Curing blows are a familiar and costly sight in some factories. Gen-Tac cuts these losses to a minimum, because it is fast curing and develops its strength in the early stages of cure when internal pressures do the most harm.

Gen-Tac Vinyl Pyridine Latex is another "Industry-proven" product of the Chemical Division of The General Tire & Rubber Company, Akron, Ohio.

THE GENERAL TIRE & RUBBER COMPANY
Chemical Division, Akron, Ohio

Chemical Division
GENERAL
THE GENERAL TIRE & RUBBER CO.
GEN-TAC



PICCOPALE

100% petroleum polymer

Versatile, compatible, permanent

By the trainload, if you wish

The extremely low cost of PICCOPALE, and its availability in enormous quantities make this new type of petroleum resin ideal for use as a basic raw material. It is chemically inert—not affected by acids, and alkalies; moisture-proof; compatible; soluble in naphthas, chlorinated and other solvents. Available in liquid solution or in flaked or solid form.

WRITE for complete data, specifications and samples.

RIBUTED BY HARWICK STANDARD CHEMICAL CO., AKRON 5, OHIO

Pennsylvania Industrial Chemical Corp.

Clairton, Pennsylvania

Plants at:
Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

District Sales Offices
Boston, New York, Detroit, Chicago, Cincinnati
Los Angeles, Philadelphia, Pittsburgh

(RW)

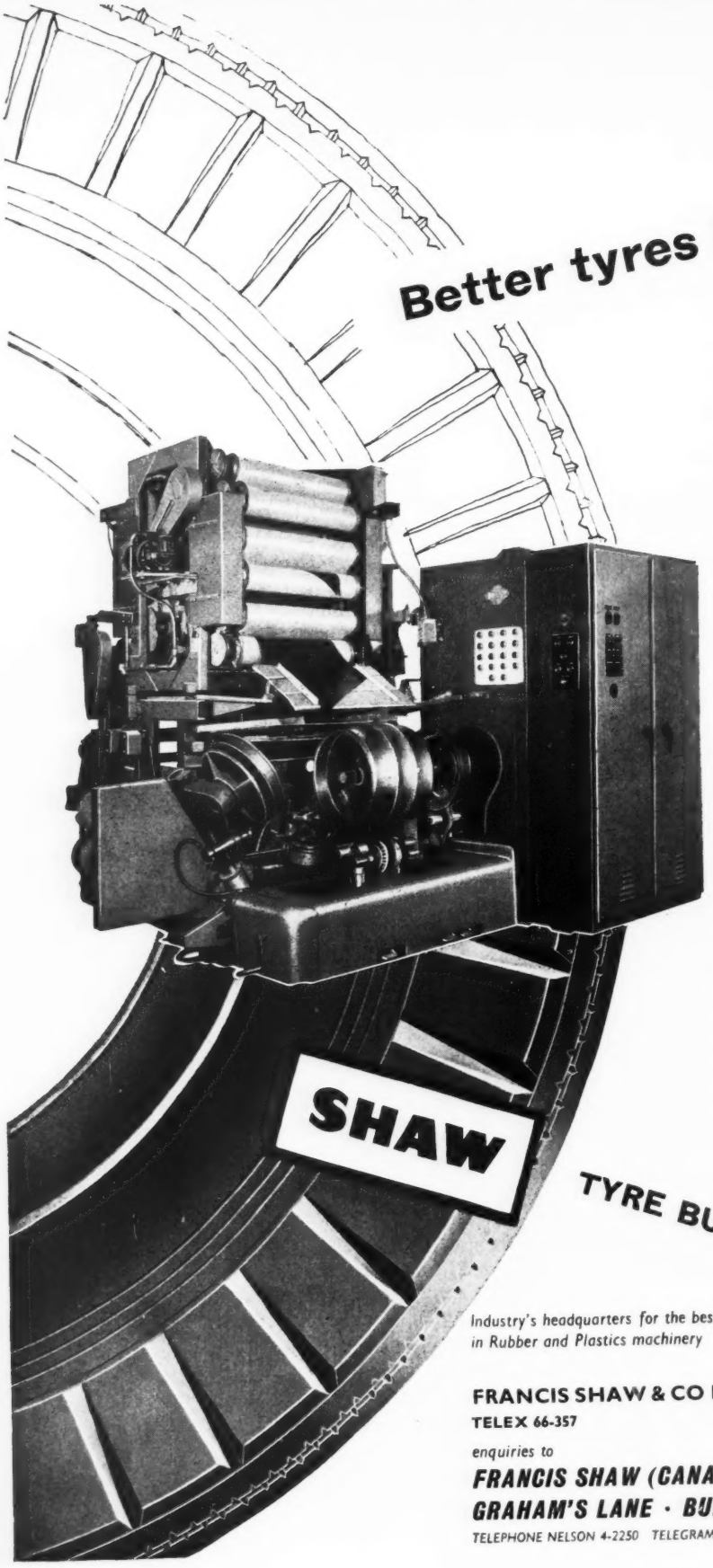
PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.
Clairton, Penna.

Please send me a copy of your bulletin describing PICCOPALE and samples of grade for (application)

Name_____ Position_____

Company_____

Address_____



Better tyres built faster

Higher output and higher quality tyres result from the Shaw Tyre Builder. Beads are firmer, even tension is achieved for each ply, stitching pressure is higher and more accurately controlled, thus giving a firmer carcass. Operator fatigue is eliminated by automatic sequencing. The servicing Turret supplies material in correct sequence. Loading the servicer does not entail loss of production time, unskilled labour being used.

function pre-selector

The 'Woodpecker' pre-selector control mechanism enables the operator to bring about every movement of the building tools from one cycle pedal. The machine can be set up without the help of mechanics or electricians, a valuable aid where short runs are usual. The control involves no timers, or electronics.

TYRE BUILDER & SERVICER

Industry's headquarters for the best in Rubber and Plastics machinery

FRANCIS SHAW & CO LTD MANCHESTER II ENGLAND
TELEX 66-357

enquiries to

FRANCIS SHAW (CANADA) LTD
GRAHAM'S LANE · BURLINGTON · ONTARIO · CANADA

TELEPHONE NELSON 4-2250 TELEGRAMS CALENDER BURLINGTON ONTARIO

2184

is your

Indonex

PLASTICIZER

circular file complete?

Check this list of INDONEX Plasticizer Circulars. If you are missing any and would like to complete your file, circle the numbers you need in the coupon and mail. Your request will be given prompt attention.

Circulars contain suggested formulations for the applications described, specifications of INDONEX Plasticizer grades recommended for each application, physical data—original and aged—on the compounds, etc.

Circulars Available INDONEX Plasticizers:

Circ. 4—in Tire Carcass Compounds
Circ. 5—in Footwear and Heel Compounds
Circ. 6—in Camel Back
Circ. 7—in Motor Mount and Bumper Compounds
Circ. 8—in Wire Jacket and Other Extruded Compounds
Circ. 12—in Low Hardness Mechanical Goods
Circ. 14—in Hycar OR-15
Circ. 15—in Natural Rubber-Reclaim Mechanical Goods and Carcass Compounds
Circ. 19—with Various Fillers in Reclaim Stocks
Circ. 21—in Mechanical Goods Compounds for High Temperature Curing
Circ. 22—in Natural Rubber of Various Qualities
Circ. 23—in Tire Curing Bag Compounds
Circ. 24—in Carcass Compounds
Circ. 25—with Various Fillers in Natural Rubber Stocks
Circ. 26—in Heat Resistant Low Compression Set Compounds
Circ. 27—in Hycar Gasket and Packing Compounds
Circ. 28—in Ground Scrap in Low Cost Compounds
Circ. 29—in Extruded Mechanical Goods
Circ. 30—in Butyl Mechanical Goods
Circ. 32—in Hose and Cover Compounds
Circ. 33—in Low Temperature GR-S Compounds
Circ. 34—in Wire & Cable Jacket Compounds
Circ. 35—in Semi-Ebonite Compounds
Circ. 36—with High Styrene Copolymers
Circ. 40—in Polyacrylic Rubbers
Circ. 41—in Neoprene W. Compounds
Circ. 42—in GR-S Camel Back
Circ. 43—in Reclaim Compounds
Circ. 44—in Super-Aging Neoprene Compounds
Circ. 45—in Extruded Butyl Automotive Compounds
Circ. 46—in "Cold Rubber" (LTP GR-S) Compounds
Circ. 47—in High Mooney Neoprene (Type WHV)
Circ. 48—in Oil Resistant GR-S Compounds
Circ. 49—in Hard Rubber Compounds
Circ. 50—in Industrial Tire Compounds
Circ. 51—in Extruded Bumper Compounds
Circ. 52—in Molded Bumper Compounds
Technical Bulletin 13—General bulletin on INDONEX Plasticizers and their compatibility with other materials

INDOIL® CHEMICAL PRODUCTS

INDOIL CHEMICAL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

Please send me INDONEX Plasticizer Circulars (circle numbers)

4 5 6 7 8 12 14 15 19 21 22
23 24 25 26 27 28 29 30 32 33 34 35
36 40 41 42 43 44 45 46 47 48 49 50
51 52

Name _____

Title _____

Address _____

City _____ Zone _____ State _____

-CH-1345-

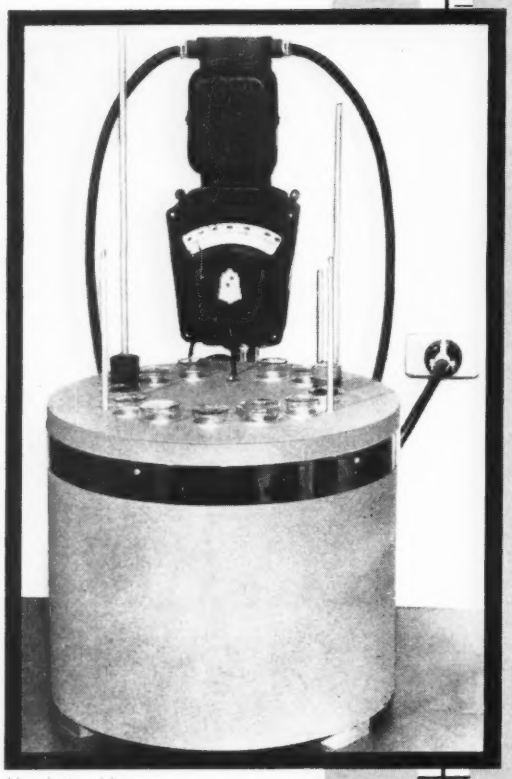
NOW YOU CAN RELY ON AGING RESULTS UP TO

600° Fahrenheit

with the new

COMET "600"

Laboratory Aging Block



Manufactured by —
Product Packaging Engineering

Designed expressly for rubber and plastics laboratories . . . suitable for test-tube aging similar to ASTM Method D-865-52-T, and aging in various fluids, such as oils and fuels. Meets all your high temperature aging requirements.

- AUTOMATICALLY controls temperatures from 100° to 600° F.
- Individual test tubes eliminate chance of circulatory air contamination. Each test sample isolated from all others.
- Built-in heating elements and temperature controls. Eliminate hazardous noxious fumes.
- Partlow Indicating and Proportioning-Type Thermostat Control used for EXACT temperature control.
- All units pre-calibrated at factory for complete precision.
- 13 holes symmetrically arranged for test tubes 38 mm. x 300 mm.
- Operates on 200-Volt, A.C. current, with five 500-Watt, 220-Volt heaters for rapid heating.
- Entire block of precision machined aluminum with removable bottom plate for easy maintenance.
- All external parts baked enamel and chrome plated.
- SIZE 15 inches high, 18 inches diameter. Weight 175 pounds.
- Equipped with secondary temperature control, integral with block. Prevents override of master control unit.

Write for full details to:

Sole Distributors
THE C. P. HALL COMPANY
414 S. BROADWAY
AKRON 8, OHIO

AKRON, OHIO
NEWARK, N. J.
CHICAGO, ILL.
LOS ANGELES, CALIF.

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

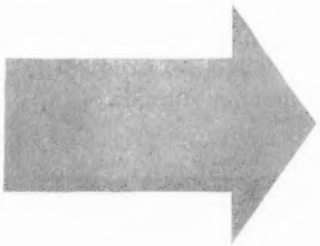
can its versatility help you?

Research activity on a white calcium silicate in the early 1930's was a failure. New attempts a few years later succeeded in overcoming some uncontrolled variables in the older techniques, and Silene was born. In those days, rubber soles and heels represented the only market. When natural rubber was decreed out of existence by the emergencies of war, Silene went out with it.

Some finer particle material subsequently developed proved better in the early GR-S prototypes than the old "standard" Silene. With a revamping of the process, Silene EF (extra fine) became a product satisfactory for GR-S inner tubes. In fact, many of the inner tubes utilizing Silene EF were better than those using straight blacks.

Then—carbon black grew very scarce and the sole and heel people turned to Silene EF, which filled a need at a critical time. Soling today still represents the principal outlet, but Columbia-Southern research and that of the rubber industry has put the versatility of Silene to work in many other ways in many other products.

The value of Silene EF is amply proved by a continual record of growth for over 15 years. Its versatility can provide the right answer to many reinforcement problems. We invite you to write today for further information and working samples. Address Columbia-Southern Chemical Corporation, Pigments Department, One Gateway Center, Pittsburgh 22, Pennsylvania.



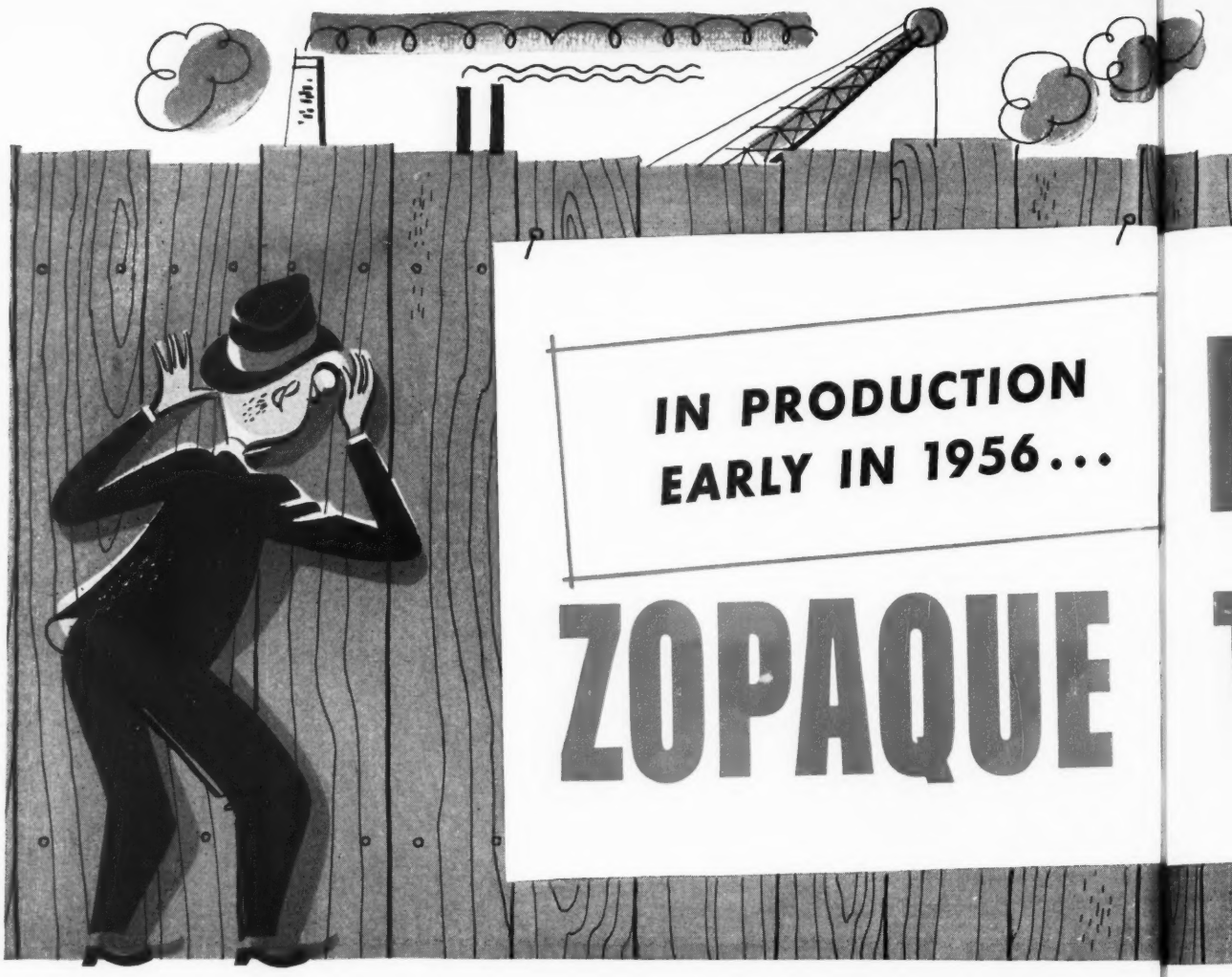
COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

ONE GATEWAY CENTER, PITTSBURGH 22, PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York St. Louis • Minneapolis • New Orleans • Dallas • Houston • Pittsburgh • Philadelphia San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division



First of 3 Big Expansions

TO GIVE YOU BETTER SERVICE WITH NEW ZOPAQUE, THE FINEST TITANIUM DIOXIDE

Glidden research has achieved greater whiteness and a highly accelerated dispersion rate in the new ZOPAQUE Titanium Dioxide. These developments combine to produce pigments with exceptional hiding power, outstanding gloss and color retention, and low reactivity. Early in 1956, Glidden will open its new plant and double its production of ZOPAQUE Titanium Dioxide. With this added production, Glidden will be in a better position than ever to serve your titanium dioxide needs.

Glidden ZOPAQUE Titanium Dioxide is available in both Rutile and Anatase grades.

Write today for more details on Glidden ZOPAQUE, the finest titanium dioxide.

NEW GLIDDEN TITANIUM PLANT

Each Batch of Titanium Ore is Tested in Pilot Plant Before it is Processed!

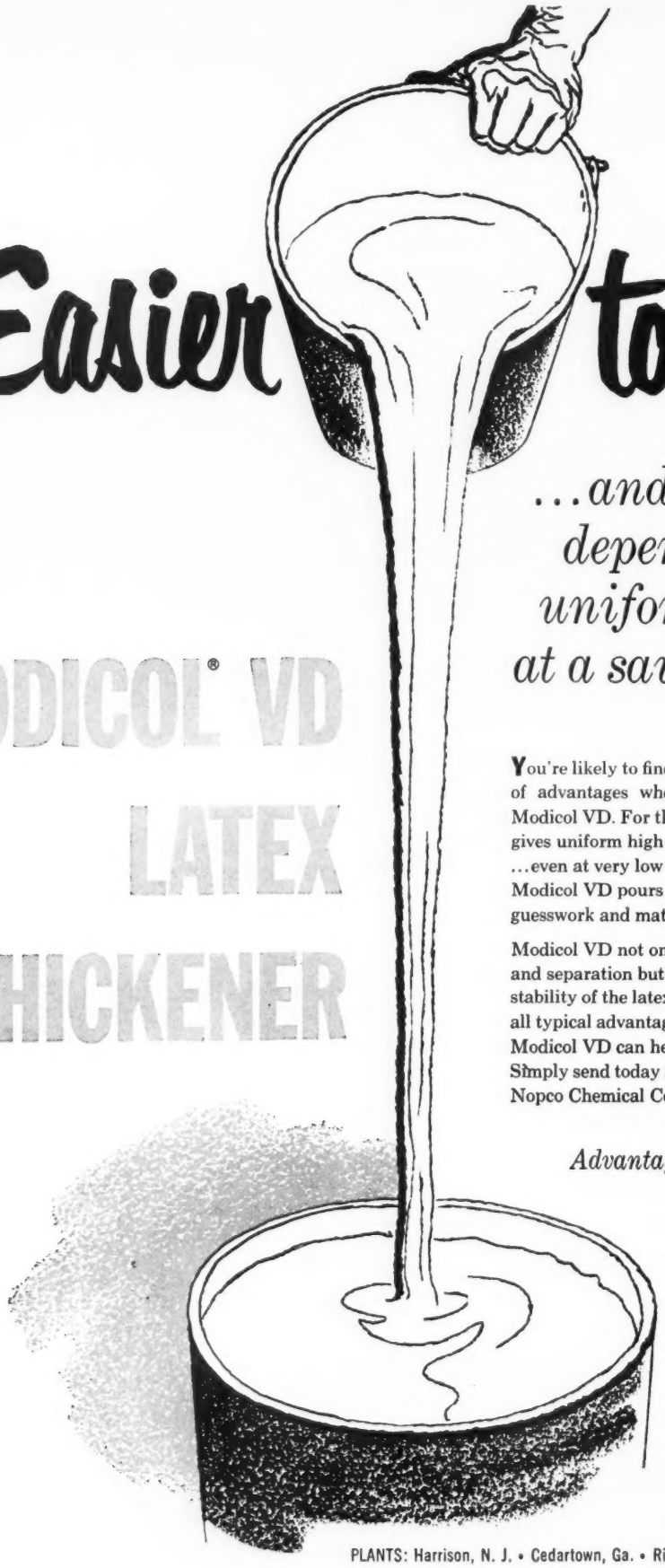
You are looking at a giant titanium plant in miniature, as set up in the Glidden Laboratories in Baltimore. In this small-scale plant, jet-black titanium ore is transformed into gleaming white pigment through a hydrolysis process. This test provides an accurate check on every shipment of ore received by Glidden. It is part of the Glidden continuous quality control program to provide you with the finest ZOPAQUE Titanium Dioxide at all times.

THE GLIDDEN COMPANY

Chemicals — Pigments — Metals Division

Baltimore, Maryland • Collinsville, Illinois • Hammond, Indiana • Scranton, Pa.

QUALITY Glidden PRODUCTS



Easier to use!

...and gives you dependably uniform viscosity at a saving!

MODICOL® VD LATEX THICKENER

You're likely to find an ideal combination of advantages when you thicken latex with Modicol VD. For this synthetic polymer gives uniform high viscosity.. smooth and gel-free ...even at very low concentrations. Modicol VD pours easily, saves you time, guesswork and material waste.

Modicol VD not only eliminates creaming and separation but also improves mechanical stability of the latex emulsions. These are all typical advantages. Why not find out how Modicol VD can help improve your own processing. Simply send today for bulletin MVD 33 to Nopco Chemical Co., Harrison, N. J.

Advantages of MODICOL VD

Easy to handle

High uniform viscosity at low concentrations

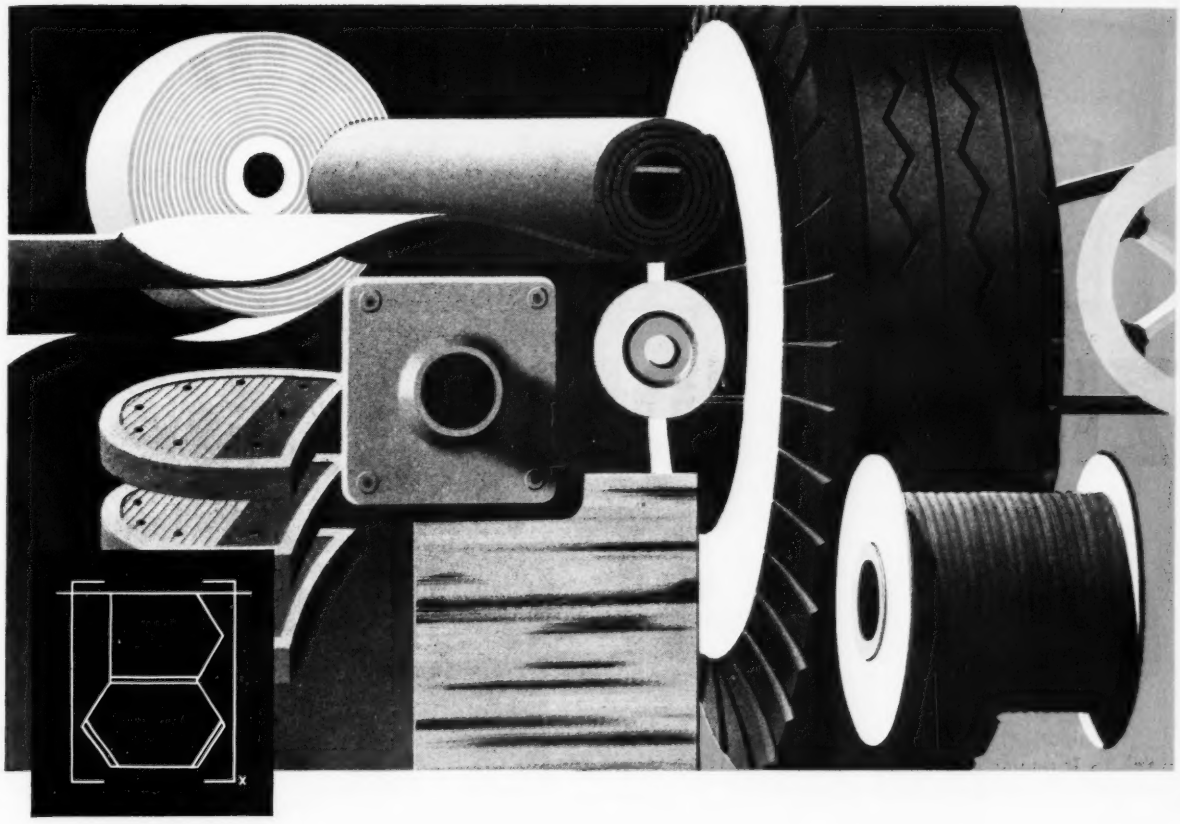
Smooth gel-free type of viscosity

Stable in alkaline fluids

Unaffected by bacteria or fungi

NOPCO

PLANTS: Harrison, N. J. • Cedartown, Ga. • Richmond, Calif. • London, Ont. Canada



Raise Quality and Lower Costs With Neville Coumarone-Indene Resins

Coumarone-indene resins by Neville have become standard in the processing of rubber for an ever-increasing variety of products in ever-greater volume throughout the years. Here's why. Users find that Neville gives them constant good quality and fast service, and they save production time and costs and produce better products when they use coumarone resins. Also, Neville has a broad variety of these ideal extender-plasticizers in various grades and melting points to suit every product need. Our chemists will gladly assist yours in selecting the proper one for your purpose. Use the coupon to write for further information.

Neville Chemical Company, Pittsburgh 25, Pa.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50 W Hi-Flash, Wire Enamel Thinners.

NEVILLE

Please send information on Neville Chemicals.

NAME TITLE

COMPANY

ADDRESS

CITY NC3-RW STATE

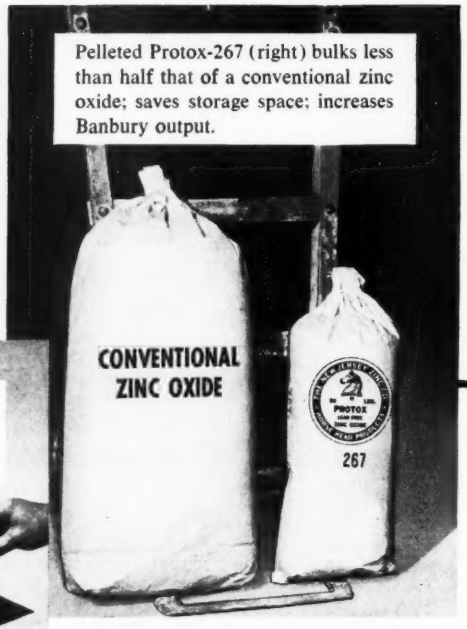
It's PROTOX-267 PELLETED ZINC OXIDE

Cuts Handling, Storage, Mixing and Processing Costs

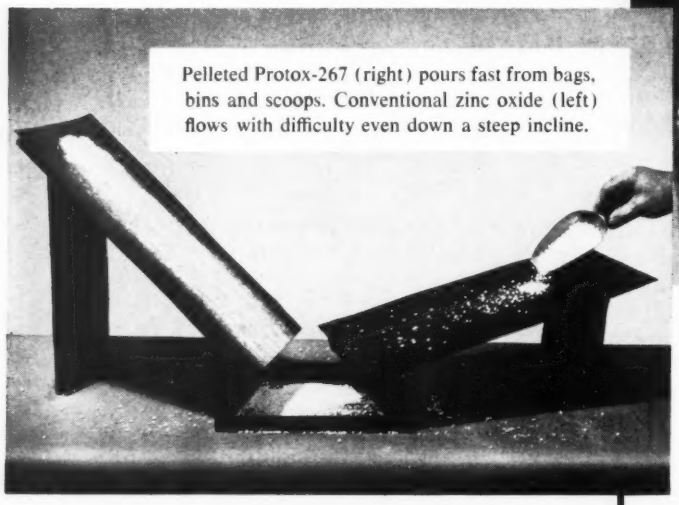
Protox-267* zinc oxide brings you the many unique advantages of both propionic acid treatment and pelleting.

Its base is Protox-166, well recognized for its fast mixing, excellent dispersion and good processing properties.

It retains all the features of Protox-166 and adds to them the important advantages of pellets.



Pelleted Protox-267 (right) bulks less than half that of a conventional zinc oxide; saves storage space; increases Banbury output.



Pelleted Protox-267 (right) pours fast from bags, bins and scoops. Conventional zinc oxide (left) flows with difficulty even down a steep incline.

- ★ *Faster, easier handling*
- ★ *Quicker weighing*
- ★ *Less dusting loss*
- ★ *Smaller storage space*
- ★ *Greater Banbury output*

Our representatives will be glad to discuss how you can cut your costs with Protox-267.

*U. S. Patents 2,303,329 and 2,303,330

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS

no wrong numbers here . . .

FLEXOL PLASTICIZERS DOP, 426, 810, 10-10, and CC-55

Trade-Mark

Each one has its place in plastics, and each one rates a listing on your books. These phthalates offer excellent heat and light stability, good resistance to water extraction, and excellent electrical properties. In addition, these five FLEXOL Plasticizers allow you to select the phthalate with the proper volatility, solvent power, and dispersing action for your use. Check these phthalates before you consider any other plasticizer for your vinyl plastics or nitrocellulose lacquers.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

FLEXOL Plasticizer DOP (di(2-ethylhexyl) phthalate)—the "standard" plasticizer for vinyls for more than ten years.

FLEXOL Plasticizer 426 (a mixed alcohol phthalate) saves you money and offers quality, too.

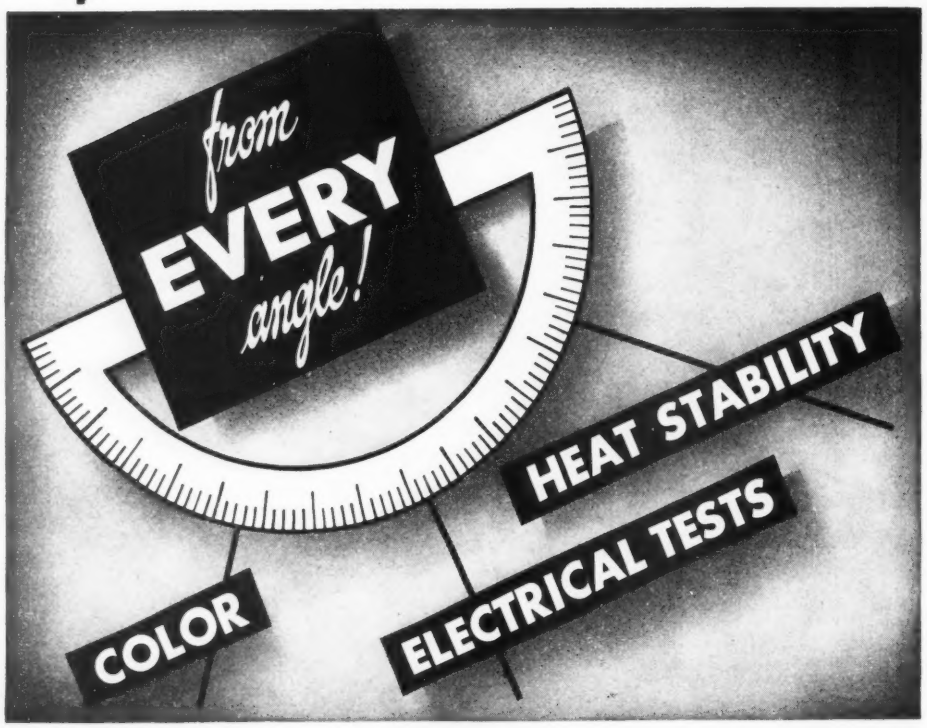
FLEXOL Plasticizer 810 (a higher alcohol phthalate) is outstanding for its low volatility and the improved low-temperature properties it imparts to vinyls. Plastisols made with 810 have excellent viscosity stability.

FLEXOL Plasticizer 10-10 (didecyl phthalate) is the least volatile of phthalate plasticizers—it has good electrical properties and is a good dispersant, too.

FLEXOL Plasticizer CC-55 (di(2-ethylhexyl) hexahydrophthalate) is an excellent dispersant for vinyl plastisols with stable, low viscosities.

To be sure you have the right phthalate every time, call or write the nearest CARBIDE office. In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Toronto.

The term "Flexol" is a registered trade-mark of Union Carbide and Carbon Corporation



PIGMENT NO. 33

for Compounding

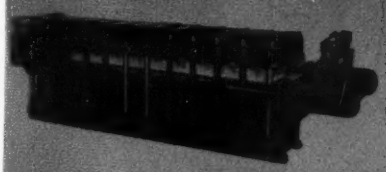
VINYLS AND SYNTHETIC RUBBER

Sample and technical data sent promptly on request

SOUTHERN CLAYS, Inc.

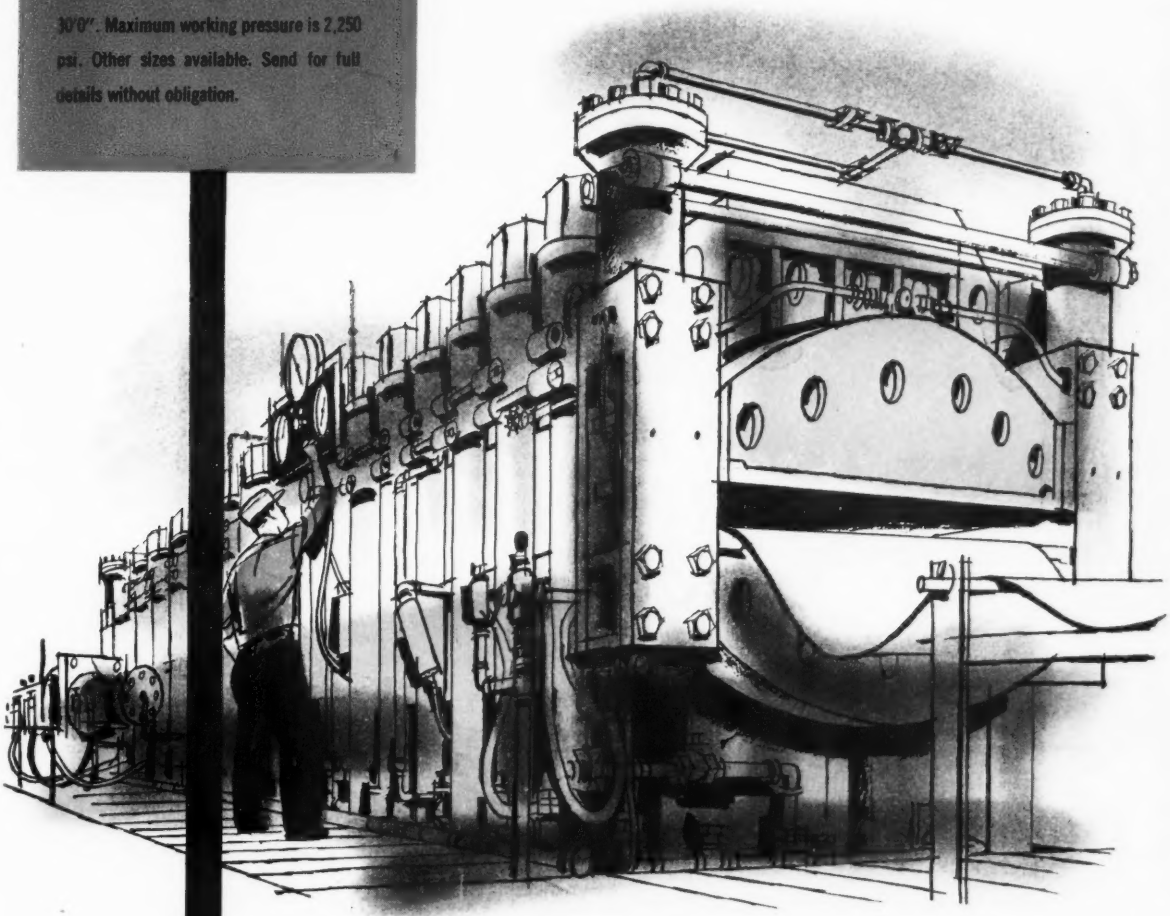
33 RECTOR STREET
NEW YORK 6, N. Y.

The standard by which other presses are judged



Single Opening Belt Press for vulcanizing rubber belting. Press is equipped with hydraulic stretcher and clamping units mounted at the ends of the moving platen to maintain tension on belt while it is being processed. Press capacity is 3,180 tons. Size of heating platens is 63¼" x 30'0". Maximum working pressure is 2,250 psi. Other sizes available. Send for full details without obligation.

The proof of any press is its performance: excellence invariably shows up in service. How to be sure of quality when you choose a press? Simply look for the name 'R. D. Wood' on the nameplate. During more than 150 years, this name has never appeared on a press of inferior quality. In every R. D. Wood press, meticulous design, select materials, scrupulous craftsmanship combine to give you over-all efficiency, operating ease, production economy and long service. Write for engineering data on R. D. Wood presses for the rubber industry.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Representatives in Principal Cities

MAKERS OF HYDRAULIC PRESSES AND VALVES • FIRE HYDRANTS • CAST-IRON PIPE • GATE VALVES • GAS PRODUCERS • ACCUMULATORS

DECREASES MIXING TIME FROM DAYS TO HOURS

Struthers Wells

RUBBER CEMENT MIXER

Write for Bulletin 58-W

Struthers Wells Rubber Cement Mixers combine high velocity and streamlined flow with the cutting action of high speed propellers to obtain unprecedented mixing speed with ease of cleaning. Available in capacities from 5 to 500 gallons, jacketed or plain, of any weldable metal. These mixers save time, labor, power and solvent. Vapor-tight "Swift Working" doors and explosion-proof motors minimize fire hazards.

Struthers Wells

STRUTHERS WELLS CORPORATION

WARREN, PA.

Plants at Warren, Pa. and Titusville, Pa. • OFFICES IN PRINCIPAL CITIES

Makers of the Trail

FEBRUARY 12, 1809 **FEBRUARY 22, 1732**

Destiny separated these two dates by less than four score years, yet the two men whose birthdays they represent were to become the two most important personalities in the unfolding of American history.

In 1732 the vast continent was still little known; people were clinging to the areas on or within short reach of the sea. In 1809, independent and free, ambitious and fearless, Americans set their faces westward and the small nation began to expand.

It was the destiny of the man born in February 1732, in spite of heart-breaking and discouraging obstacles, to join a people together; it was the destiny of the one born in 1809 to keep this same people together.

These were the men, each in his own time and under the circumstances which surrounded him, who blazed a new trail into the future, a trail for a nation and all of its people, for all the years to come. Out of their struggles and sacrifices, and out of their faith and constancy has grown America and democracy and freedom, "of the people, by the people, for the people," which we may easily follow if we so choose. Because of Washington and Lincoln the trail became well marked for all time.

UNITED CARBON COMPANY, INC.

MAKERS OF CARBON BLACKS FOR TODAY'S TIRES

DIXIE 70

Advance thinking on carbon black is set on intermediate super abrasion furnace black, ISAF — Dixie 70, to be sure — the oil-base black widely favored in natural and synthetic rubbers. It does well in processing and imparts exceptional reinforcement, improved tread wear, and better resistance to tread cracking.

Dixie 70 is in step with the need of an expertly-made black with stamina for modern rubber goods.

For excellence in blacks specify United. Their brands are a warranty of quality understood and sought after by compounders everywhere.

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

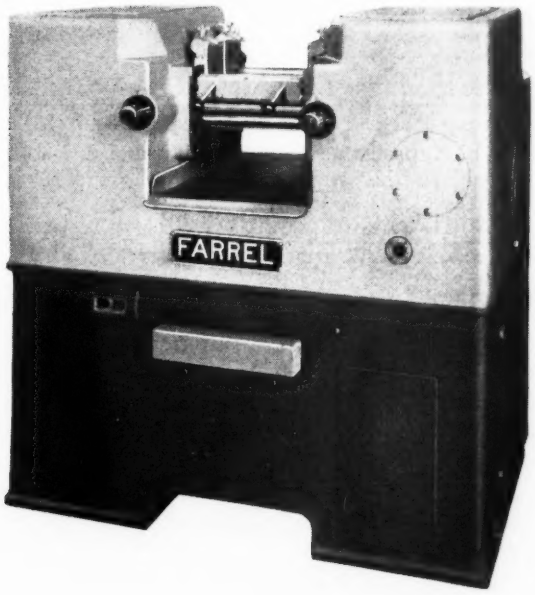
CHARLESTON 27, WEST VIRGINIA

NEW YORK AKRON CHICAGO BOSTON MEMPHIS

Battelle Memorial Institute
Bauer and Black
Division of the Kendall Company
Godfrey L. Cabot, Inc.
Celanese Corporation of America

Here are 30 VOTES OF APPROVAL

for Farrel's "new-style" LABORATORY MILL



Dow Chemical Co.
E. I. Du Pont De Nemours & Co., Inc.
Durez Plastics & Chemicals, Inc.
Esso Research & Engineering Co.
Esso Standard Oil Co.
General Electric Company
General Tire & Rubber Co.
Harshaw Chemical Co., Inc.
Interchemical Corporation
Johns-Manville Research Center
The Kerite Company
Koppers Company, Inc.
Linde Air Products Co.
Merck & Co., Inc.
Monsanto Chemical Co.
The Okonite Co.
Proctor & Gamble Co.
Remington Arms Company, Inc.
Shell Chemical Corporation
Spencer Chemical Co.
U. S. Rubber Company
University of California
R. T. Vanderbilt Co., Inc.
Western Electric Co.
Westinghouse Electric Corporation
Witco Chemical Co.

Method of Speed Control	No. of Motors	HP Each Motor	Friction Ratio	Roll Speed (RPM) Front	Roll Speed (RPM) Back
Constant	1 (AC)	7½	1.4:1	23.5	33
Vari-pitch Pulley	1 (AC)	7½	1.4:1	13 to 24	18 to 34
Vari-pitch Pulleys	2 (AC)	5	Variable	20 to 38	18 to 34
Adjustable Voltage	2 (DC)	5	Variable	4.5 to 34	6 to 45

You can get an idea of the popularity of Farrel's two-roll, 6″ x 13″ lab mill from that *partial* list of users. A number of these big names in industry have sent in repeat orders for one or more additional mills.

One reason for this wide acceptance is that, in standard form, the mill comes with four different drive arrangements (see chart). One of these should give *you* exactly the roll speed or speeds, and friction ratio you need for experimental work.

Another reason is that, although these mills are basically standard, they can be tailored to suit any manufacturer's requirements with the choice of many design features.

Send for further information about this versatile mill, or ask to see a Farrel engineer about your laboratory equipment problems.

FARREL-BIRMINGHAM COMPANY, INC.
Ansonia, Connecticut

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Fayetteville (N. C.), Los Angeles, Houston

FB-1049

Farrel-Birmingham®

FOR TOP QUALITY PRODUCTION *Specify*

Burgess Anhydrous Aluminum Silicate Pigments

USE BURGESS "ICEBERG" and "ICEBERG K" PIGMENTS

- **For Vinyl Extrusion Compounds and Vinyl Floor Covering Compounds** "Iceberg" provides excellent base color as a white mineral loading, excellent resistance to alkalis and acids, high specific resistance with low moisture absorption properties.
- **For Butyl Wire and Insulating Compounds** "Iceberg" possesses excellent processing, reinforcing, and good electrical properties.
- **For Colored Butyl Inner Tubes, Drug Sundries and Mechanical Goods** "Iceberg" possesses excellent color, processing and curing properties and low moisture absorption.
- **For GR-S Compounding** "Iceberg" is useful in compounds requiring good white filler with good processing properties, i.e., "Iceberg" prevents stickiness on the mill and also prevents die-plating of extrusion compounds.

USE BURGESS "NO. 30" and "30 K" PIGMENTS

- **For Vinyl Insulating and Electrical Compounds** No. 30 possesses excellent color and yields high insulation resistance values.
- **For GR-S Compounds** No. 30 acts as a good reinforcing agent and filler with a high degree of uniformity with respect to specific resistance, low moisture absorption, good color and brightness.

USE BURGESS "PIGMENT NO. 20" (Hydrous)

- **For Natural and Synthetic Rubber Compounds** No. 20 yields level cures because of controlled pH.
- **For Rubber Footwear Compounds** No. 20 possesses excellent reinforcing characteristics and good color.

Ask your Burgess representative for technical data, working samples, and prices.

Burgess Pigment COMPANY

Mines and Plants: Sandersville, Georgia

EXECUTIVE SALES OFFICES: P. O. BOX 145, SANDERSVILLE, GA.
West Coast: L. H. Butcher Co., San Francisco & Los Angeles, Cal.
Warehouses: Jersey City & Trenton, N. J.; Saylesville, R. I.

- **HYDROUS AND ANHYDROUS ALUMINUM SILICATE PIGMENTS**
- **KAOLIN CLAYS**

For resistance to crystallization—

use

NEOPRENE TYPE WRT

for minimum stiffening at subnormal temperatures

When only moderate resistance to stiffening is required, use the more economical blend of 35% Type WRT and 65% Type W. This blend equals Type GN in cost and in resistance to crystallization while providing the advantages of W types.

Like all W types of neoprene, NEOPRENE TYPE WRT handles well on the mill and is very stable in storage. Moreover, Type WRT resists stiffening in the uncured state... stocks retain tack... building operations proceed smoothly.

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division
DISTRICT OFFICES:

Akron 8, Ohio, 40 E. Buchtel Ave..... POrtage 2-8461
Atlanta, Ga., 1261 Spring St., N. W..... EMerson 5391
Boston 10, Mass., 140 Federal St. ..... HAncock 6-1711
Charlotte 2, N. C., 427 West Fourth St..... FRanklin 5-5561
Chicago 3, Ill., 7 South Dearborn St. ..... ANdover 3-7000
Detroit 35, Mich., 13000 West 7-Mile Rd..... UNiversity 4-1963
Houston 25, Texas, 1100 E. Holcombe Blvd..... JAckson 8-1432
Los Angeles 58, Calif., 2930 E. 44th St..... LOgan 5-6464
Trenton 8, N. J., 1750 North Olden Ave..... EXport 3-7141
In Canada contact Du Pont Company of Canada Limited, Box 660, Montreal

Du Pont
NEOPRENE

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING... *THROUGH CHEMISTRY*

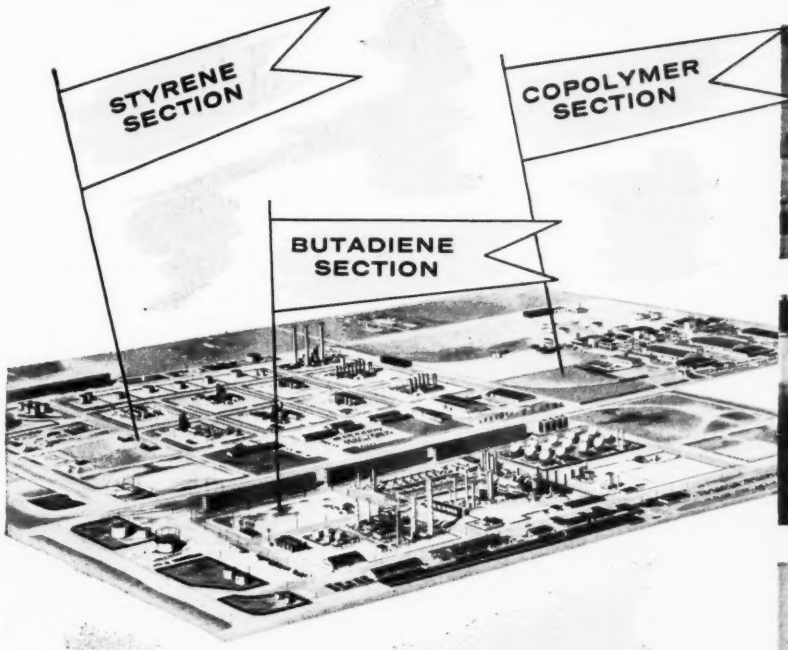
Sweet music for vinyl processors

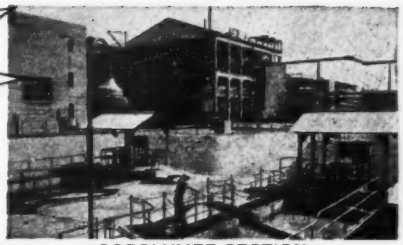
is produced with DIAMOND ALKALI'S CHLOROWAX 70®, a chlorinated resin, widely used by makers of phonograph records and many other rigid and semi-rigid products. Besides reducing costs, CHLOROWAX 70 blends easily, helps compounds to flow freely in heated molds.

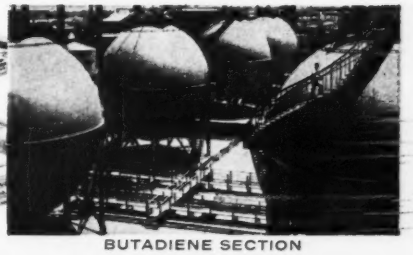
If you want a low-cost, resinous modifier that will aid processing, pigment dispersion and flow, let us tell you about CHLOROWAX 70. Call or write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND CHEMICALS

Diamond Chemicals




COPOLYMER SECTION

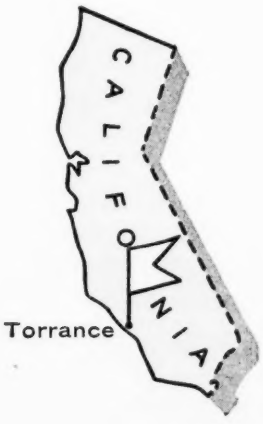

BUTADIENE SECTION

STYRENE SECTION

In the West...

Here's the handy source of

Synthetic Rubber



Shell Chemical offers a wide line of general-purpose polymers

Torrance, California, deserves a big star on your map of rubber sources. It's the home of Shell Chemical's synthetic rubber plant . . . one of the nation's best equipped for the production of a variety of types of butadiene-styrene rubber.

Whether you need a bale or a carload . . . for sheeting, molded goods, extruded goods, tires or other uses, Shell Chemical can fill your requirements.

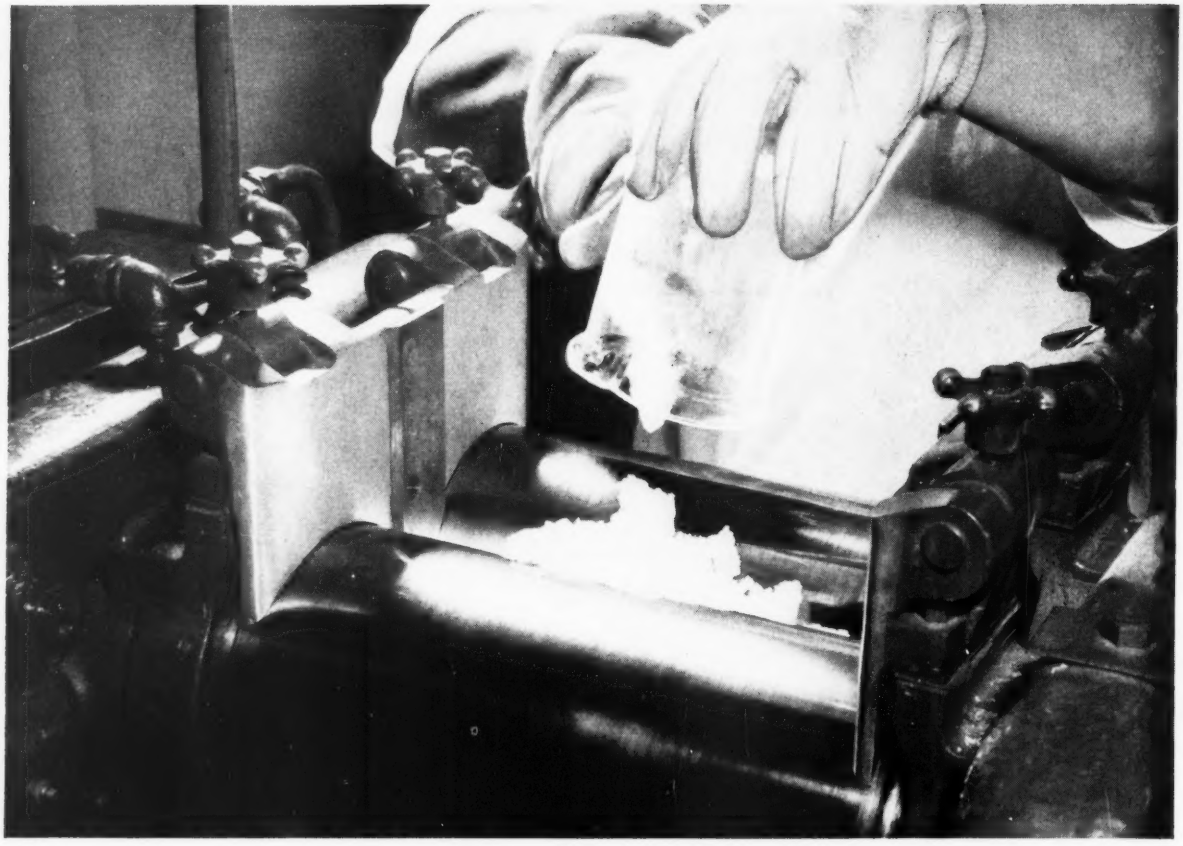
Our technical staff will be glad to discuss your needs. Phone or write Synthetic Rubber Sales Division, P.O. Box 216, Torrance, California. Phone FAculty 1-3710 or DAvis 4-4991.

SHELL CHEMICAL CORPORATION

Synthetic Rubber Sales Division

P. O. Box 216, Torrance, California

SHELL



FROM THIS
TO A PERMANENT PLASTIC
IN 50 SECONDS WITH...

HARFLEX® 300

Tests show that this efficient polymeric will plasticize PVC resins in 45 to 50 seconds. No secondary plasticizers are needed to produce plastics which are permanent, non-migratory, and have excellent low-temperature properties. Harflex® 300 is the first easy processing, polymeric plasticizer to become available for vinyl resins.

YOUR INQUIRIES ARE INVITED:

At your request, a free booklet will be sent to you giving complete information about Harflex® 300. Samples of Harchem's other plasticizers (Sebacates, Phthalates, Adipates) are also available. Write to us giving your requirements for experimental or test work.

COLUMBIAN CARBON COMPANY, DISTRIBUTOR TO THE RUBBER INDUSTRY

SEBACATES
PHTHALATES
ADIPATES

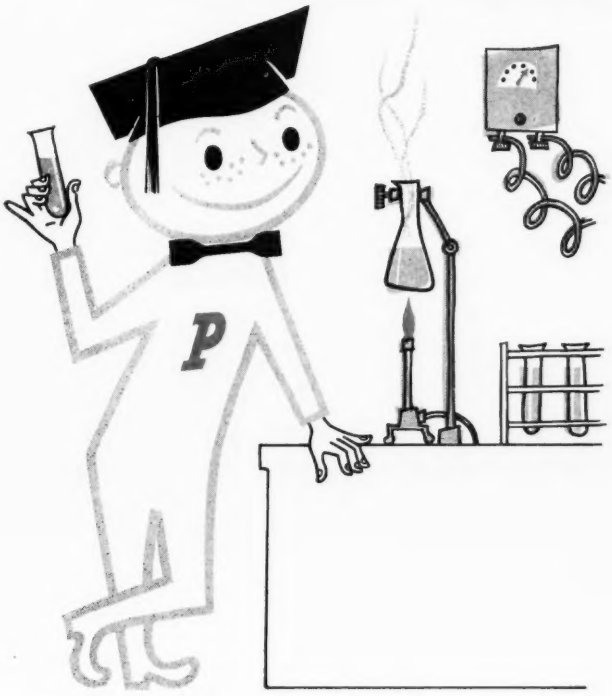
THE KEY TO HARCHEM® BETTER PLASTICS

HARCHEM DIVISION

WALLACE & TIERNAN, INC.
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
IN CANADA: W. C. HARDESTY CO. OF CANADA, LTD., TORONTO

H-19-R

Call on Philprene® for Valuable Technical Assistance



You've got to know the answers to a lot of technical questions when you're in the rubber business! Phillips Chemical Company is an old-timer in the field of synthetic rubber research; we grew up with the industry. We also are pioneers in creating polymers and masterbatches to meet specific needs.

Our technical department, for example, can help with such problems as how to prevent staining . . . how to control shrinkage or die swell . . . how to improve physical properties without increasing costs. Our modern, well-staffed, fully-equipped sales service laboratory is continually testing and experimenting . . . and coming up with practical solutions to many rubber problems. Take advantage of our technical assistance, without obligation. Just consult our Technical Representative.

CURRENT PHILPRENES	*Each is comparable to former GR-S with the same numerical designation except 1605 and 1803 as noted below.* HOT	COLD	COLD OIL EXTENDED
POLYMERS	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1010 PHILPRENE 1018 PHILPRENE 1019	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503 NOTE: PHILPRENE 1019 AND 1503 ARE ESPECIALLY DESIGNED FOR THE WIRE AND CABLE INDUSTRY	PHILPRENE 1703 PHILPRENE 1706 PHILPRENE 1708 PHILPRENE 1712
MASTERBATCHES		PHILPRENE 1601 PHILPRENE 1605* *Philblack A cold rubber masterbatch	PHILPRENE 1803 similar to GR-S 1801 but incorporating 25 parts Philrich 5

PHILLIPS CHEMICAL COMPANY
Rubber Chemicals Division
318 Water Street, Akron 8, Ohio

Phillips 66

A big step foward for NYLON

Nylon Heavy Yarns are of special interest in the production of automobile

industrial textiles...

HEAVY YARNS

OF ALLIED CHEMICAL'S

*caprolan**

Tensile-Tough Nylon

Now Available: a completely new class of durable textile yarns for industrial fabrics and mechanical goods where toughness and high impact strength are essential requirements. Called Caprolan *tensile-tough* nylon, the heavy yarns are now being produced in 2,100, 2,500, 5,000 and 15,000 total denier. Eventually they will be produced in the complete range of 2,000 to 50,000 total denier according to your specifications.

Caprolan *tensile-tough* nylon heavy yarns have a *minimum* average standard tenacity of 6.5 grams per denier, and retain 90 per cent of their strength in the wet state. Initial put-ups are on ten-pound parallel packages and contain *nominal* twist. These packages create no twisting problems in the mill and eliminate the need to ply several ends of smaller deniers to obtain a higher total effect.

For information and technical assistance, write: Fiber Sales and Service,

NATIONAL ANILINE DIVISION

261 Madison Avenue — *New York 16, N. Y.*

Allied Chemical

*TRADE-MARK

Branch Offices — Jefferson Standard Building, Greensboro, N. C.; 200-204 S. Front St., Philadelphia 6, Pa.; 15 Westminster St., Providence 3, R. I.

safety belts, hoses, heavy duck, conveyor fabrics, filter fabrics, industrial slings, webbing, tapes, cords, seine twine, belting and rope.

Quality control...

St. Joe lead-free Zinc Oxides for Rubber Compounds

REGULAR • COATED • PELLETS

The ore from which St. Joe lead-free Zinc Oxides are mainly produced originates in the foothills of the Adirondack Mountains, where the St. Joseph Lead Co. wholly owns and operates zinc mines at Balmat and Edwards, St. Lawrence County. These properties are among the greatest zinc deposits in the United States. The concentrates produced here are shipped to our electrothermic zinc smelter at Josephtown, Pa. for conversion into zinc oxides by the direct-from-ore, or American Process. Quality control – one of St. Joe's most important production tools–literally begins underground at the mine and is exercised at each step of the process by the technological staffs of laboratories located in our mines, mills and the smelter. The ores, equipment and procedure used in the production of St. Joe High-Grade Zinc metal of 99.98+% purity – and commanding a premium market price – are identical with those used in the production of St. Joe lead-free Zinc Oxides. This quality-factor accounts for their steadily increasing use in rubber compounds.

*from ORE – *The Balmat Mine: The mine, mill and town of Balmat, N.Y., developed and built by the St. Joseph Lead Co., between 1926 and 1938. The Company's other mine and mill is located in the nearby town of Edwards, N.Y.*

*to OXIDE – *The St. Joseph Lead Company's smelter and zinc oxide plant at Josephtown, Pa., on the south bank of the Ohio River about 30 miles northwest of Pittsburgh.*

ST. JOSEPH LEAD COMPANY
250 Park Avenue, New York 17, N.Y.

MICROFLAKE

UNSURPASSED

Protection Against Ozone & Sunlight

In natural, GR-S, Neoprene and Butyl rubbers MICROFLAKE offers maximum protection against the action of atmospheric deterioration. Blooming to the surface, it forms a continuous protective film which does not change under varying climatic conditions, due to the migration rate being fairly constant at high or low temperatures.

Low melting point of MICROFLAKE, plus its very small thin flake size assures rapid and complete dispersion during mixing. It has no effect on the rate of cure.

MICROFLAKE is recommended for passenger car, truck, and tractor tires, channel rubbers, weatherstrips, boots, gas tank filler, neck grommets, insulated wire and cable, hose, belting, footwear, clothing, druggist sundries, and sponge rubber products such as door and trunk sealers.

A test sample incorporated in any of your compounds will convince you of MICROFLAKE's outstanding protective qualities. Write us today. . . . No Obligation, of course.

Also Mfgrs. of **RUBBEROL** **SYNTHOL** *and*
GLYCERIZED LUBRICANT

QUALITY SINCE 1884

GENSEKE BROTHERS

RUBBER MATERIALS DIVISION

West 48th Place and Whipple Street — Chicago 32, U.S.A.

UNION CARBIDE has long been closely identified with silicones through the work of its Division, Linde Air Products Company. To an important degree, industry has come to "Look to LINDE for Silicones."

Silicones are incredibly versatile man-made chemicals offering startling advantages in more and more products and processes. You may find that their stability under wide temperature change is the quality that interests you. Or it may be their water repellency, their high electrical resistance, or some other special property.

Interesting new developments, as well as the many proven needs, have now led to the formation by Union Carbide of a Silicones Division. With the world's most modern silicones plant almost ready to go on stream at Long Reach, W. Va., this new Division will be responsible for Union Carbide's program for the development, manufacture, and sale of silicone products.

This is more than just a change of name. While addresses and telephone numbers will remain the same, customers will be served by still further expanded sales and technical staffs.

But of prime importance, it means that through the expanded organization and vastly increased output, Union Carbide will provide more silicone products, in a greater variety, to match the needs of the fast-growing number of its silicone users. If you haven't already checked on the potentialities of silicones in your business, you should. Now, more than ever, it will pay you to...

UNION CARBIDE Trade-Mark SILICONES

Look to UNION CARBIDE *for silicones*

For example, quick, clean release of tires from molds has been achieved with LINDE L-45 and LE-45 Silicones, while LE-450 has won widespread acceptance for release of mechanical rubber goods. It will pay you to speed and improve your rubber release operations with UNION CARBIDE L-45, LE-45, and LE-450 Silicones.

WALTER D. TAYLOR — 1929: joined company. Served 5 years as machinist apprentice; 5 years as machinist; one year on gear drives. 1941: transferred to sales and service. 1945: made senior sales engineer. Presently manager of field service.

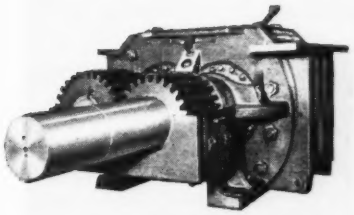
RICHARD E. BAKER, JR.—1937: came to Farrel-Birmingham from Ford Motor Company as skilled machine assembler. Erector for ten years, last two as group leader. 1946: transferred to Banbury division as sales-service engineer.

GEORGE WILSON—1940: joined Farrel-Birmingham as learner. Made machine assembler following year. 1943-55: machinery installation in customers' plants. 1955: transferred to Banbury division as sales-service engineer.

88 YEARS OF EXPERIENCE...
ready to inspect your Banbury® mixers

ALFRED W. MARSCH—1940-44: Farrel-Birmingham apprentice. 1944-46: U. S. Army—returned to company as machine erector. 1954: transferred to Akron as sales-service engineer.

EDWARD H. SHORTELL—1941: started as learner-erector. Became machine assembler same year. 1945: made erector of machinery — has handled large installations in customers' plants. 1955: transferred to Chicago as sales-service engineer.



The five Farrel-Birmingham service engineers pictured above have spent a combined total of 88 years working on Banbury mixers. They know the Banbury inside and out . . . from hopper to discharge door . . . from drive to recording device. They understand the basic principles of the machine, and have behind them the facilities, knowledge and experience of the company which originated and brought the Banbury to its present state of development.

It's wise for anyone responsible for the maintenance of Banbury mixers to call in one of these men periodically. He will inspect gears, bearings, mixing chamber, etc., for wear — then make a detailed report with recommendations. The inspection, which is made without charge, necessitates stopping a machine for about an hour, and having a man available to assist.

As a result of this inspection it may be possible to make adjustments and minor on-the-job repairs to keep your machine in production, and perhaps avert, or at least postpone, the need for major overhaul and parts replacement. All Farrel-Birmingham service men are salaried employees and share the company's interest in keeping your Banburys in top operating condition at the least expense to you.

If you would like your Banbury mixers inspected, call or write and set a date that is convenient for you.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN. (REgent 4-3331)
AKRON 8, OHIO, 2710 First National Tower (POrtage 2-8871)
CHICAGO 3, ILL., 120 South LaSalle Street (ANdover 3-6434)
LOS ANGELES 21, CAL., 2032 Santa Fe Ave. (LUdlow 5-3017)
HOUSTON 2, TEXAS, 860A M & M Building (CApitol 2-6242)
FAYETTEVILLE, N. C., P. O. Box 3157 (3-0353)

**TWO LOCATIONS—
TWO PLANS FOR
BANBURY BODY EXCHANGE**

1. For fastest service you can exchange a worn Banbury body for a new one. We carry large stocks of bodies at our Buffalo plant for shipment to western points, and at our Derby plant for shipment to eastern points.

2. When you can plan ahead on your shutdown period, we can reserve a rebuilt body from the number that is continually in process at our Derby plant. Rebuilt bodies cost less than new ones but carry the same guarantee.

Farrel-Birmingham®

FB-1050

Manufacturers of CANARY LINERS

Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

EXPORT AGENT
Binney & Smith International, Inc.
380 Madison Ave., New York 17, N. Y.

CANADIAN AGENT
Columbian Carbon (Canada) Ltd.
33 Edward Street, Toronto 3, Ontario, Canada

J. J. WHITE Products Co.

7000 UNION AVENUE
CLEVELAND 5, OHIO

Factice
THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO

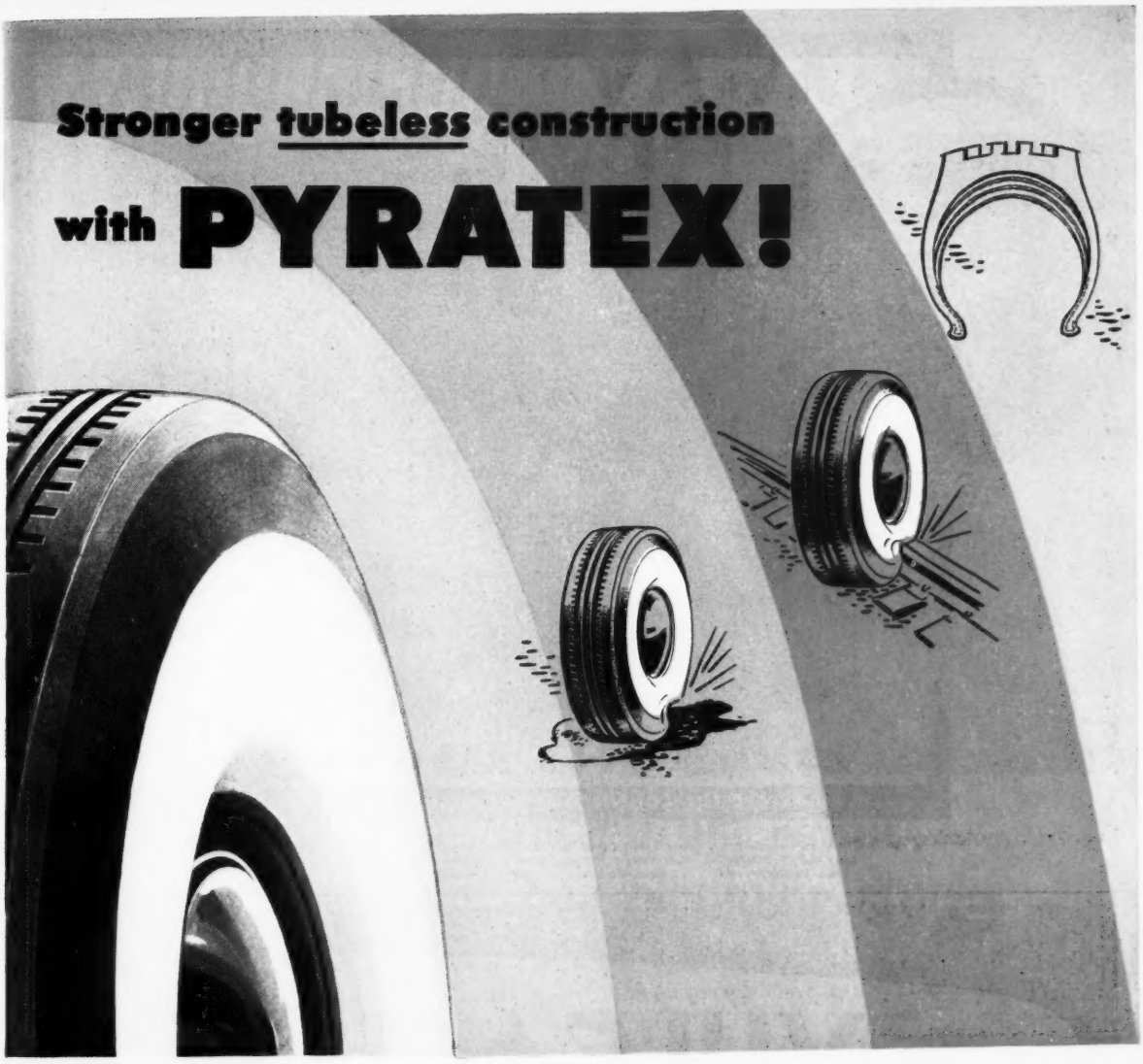
"FACTICE"®
A *Complete* LINE OF
WHITE
BROWN
and AMBER
GRADES

OLDEST AND LARGEST MANUFACTURERS OF "FACTICE" BRAND VULCANIZED OIL SINCE 1900

LEADERS IN THE FIELD
For
RESEARCH and
MANUFACTURING
DEPENDABILITY

THE STAMFORD RUBBER SUPPLY COMPANY, STAMFORD, CONN.

Stronger tubeless construction with PYRATEX!



PYRATEX INCREASES CORD-TO-RUBBER BOND UP TO 50%...strengthens tires against impact, and ply separation...helps make possible the popular new tubeless tires. Specifically developed to increase adhesion between rayon or nylon cord and rubber, Pyratex provides greater carcass strength.

A vinyl pyridine latex developed by Naugatuck, Pyratex will increase fatigue resistance and reduce ply separation in *all* reinforced rubber products. For superior performance in *your* automobile, bus, truck or airplane tires, V-belts, conveyor belts, or any other reinforced rubber product, *try Pyratex.* It is available for further compounding, or as a Lotol®, custom-compounded and ready for use.

For more information about how Pyratex can help improve *your* reinforced rubber products, write to us on your company letterhead, today.

PYRATEX...

- secures cord to rubber with a grip stronger than the stock itself
- keeps its outstanding adhesion under high-speed flexing and heat
- develops its adhesion more rapidly with cure
- greatly reduces "curing blows"
- has a higher solid content, for more convenient use

US RUBBER

United States Rubber

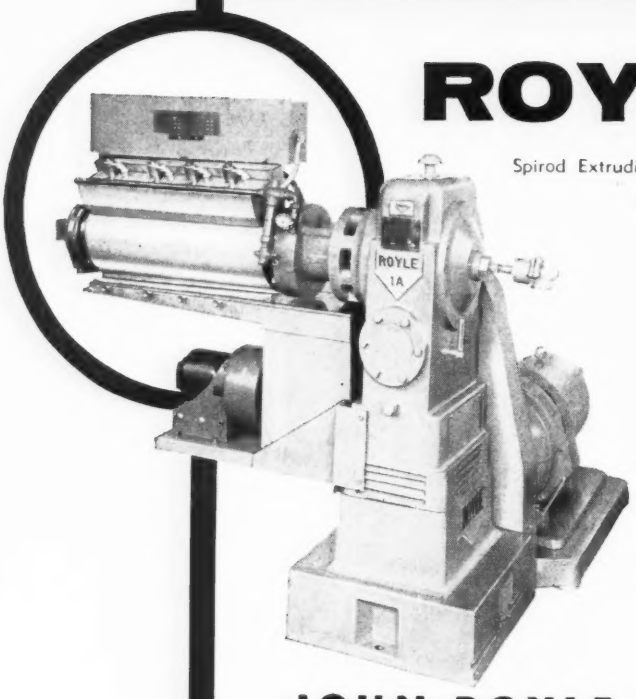
Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Chicago • Memphis • New York • Phila. • Mfg.: Los Angeles • Gastonia • Naugatuck • CANADA: Naugatuck Chemicals, Elmira, Ont.
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

ROYLE

1A (2½" cylinder bore)



Spirod Extruding Machine with electric heating and high velocity evaporative cooling. An all-purpose extruding machine for processing rubber and plastics.
Available in sizes 1⅛" through 12" cylinder bore.

Strainers, Cooling Troughs, Light Wire and Cable Capstans, Motorized Take-ups, Temperature Control Units.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England
James Day (Machinery) Ltd.
Hyde Park 2430 - 0456

Home Office
V. M. Hovey J. W. VanRiper
SHerwood 2-8262

Akron, Ohio
J. C. Clinefelter
SWendale 4-5020

Los Angeles, Cal.
H. M. Royal, Inc.
LOgan 3261

PATERSON 3, NEW JERSEY

VULCACURE*

ALCO PRODUCTS

AQUEOUS SUSPENSIONS OF ULTRA ACCELERATORS, BY A NEW PROCESS, FOR LATEX COMPOUNDING

VULCACURE ZM
50% Zinc Dimethyldithiocarbamate

VULCACURE ZE
50% Zinc Diethyldithiocarbamate

VULCACURE ZB
50% Zinc Dibutyldithiocarbamate

VULCACURE NB
47% Sodium Dibutyldithiocarbamate

PROVEN PRACTICAL AND ECONOMICAL

PARTICLE SIZE BETTER THAN FORTY-EIGHT HOUR BALL MILLED DISPERSIONS

Our sales and technical staffs are at your disposal

*Registered Trademark

WEST COAST REPRESENTATIVE:
H. M. Royal, Inc.
Wilse... 4814 Loma Vista Ave.
Los Angeles 58, Calif.
Phone: Logan 3261

ALCO OIL & CHEMICAL CORP.

Trenton Ave. and William St., Philadelphia 34, Pa.
PHONE: GArfield 5-0621

NEW ENGLAND OFFICE:
Alco Oil & Chemical Corp.
610 Industrial Trust Building
Providence 3, R. I.
Phone: Elmhurst 1-4559

Announcing VA-7

... an economical vulcanizing agent for heat-resistant, non-blooming stocks

VA-7 is a new liquid vulcanizing agent for all types of unsaturated elastomers. It provides economical "sulfurless" cures for nitrile, GR-S and natural rubber stocks.

Stocks compounded with VA-7 display an outstanding combination of heat aging resistance . . . . high tensile strengths . . . . good hot compression set resistance . . . . and non-blooming characteristics in the cured and uncured states.

VA-7 also offers processing advantages—it can be dispersed more easily and uniformly than sulfur. Stable emulsions for curing latices can easily be prepared from VA-7.

The moderate price of VA-7 is another feature that makes this product worth your investigation. *Try VA-7 for heat-resistant, non-blooming stocks at reasonable cost!*

For compounding information and a sample of VA-7 fill out and mail the handy coupon.

CHECK LIST OF VA-7 PROPERTIES

Outstanding heat aging resistance
Non-blooming in cured or uncured state
High strengths at low concentrations
Easy and uniform dispersion
Good hot compression set
Moderate price

THIOKOL CHEMICAL CORPORATION
780 N. Clinton Avenue
Trenton 7, New Jersey

Please send me compounding information ☐
and a sample of VA-7 ☐

NAME _____ FUNCTION _____

COMPANY _____

STREET _____

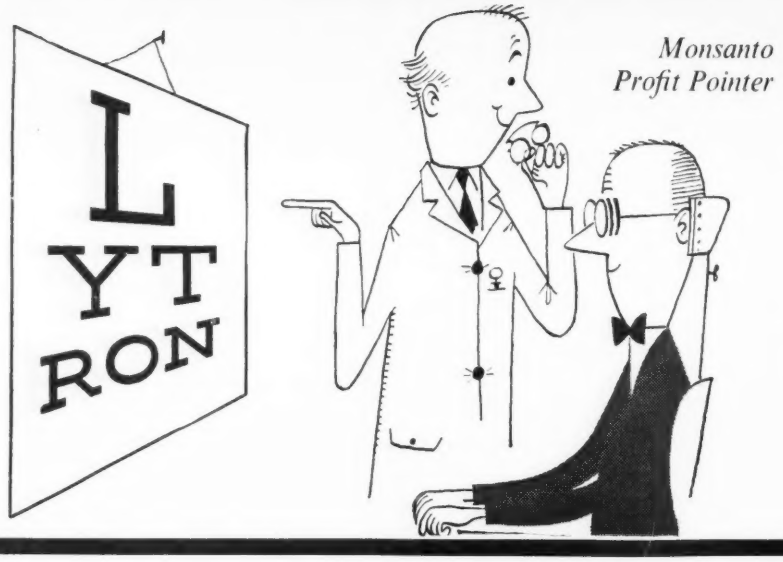
CITY AND ZONE _____ STATE _____

Thiokol® Chemical Corporation

SYNTHETIC RUBBERS • PLASTICIZERS • CHEMICALS • ROCKET MOTORS

780 NORTH CLINTON AVENUE • TRENTON 7, NEW JERSEY

In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario



Monsanto
Profit Pointer

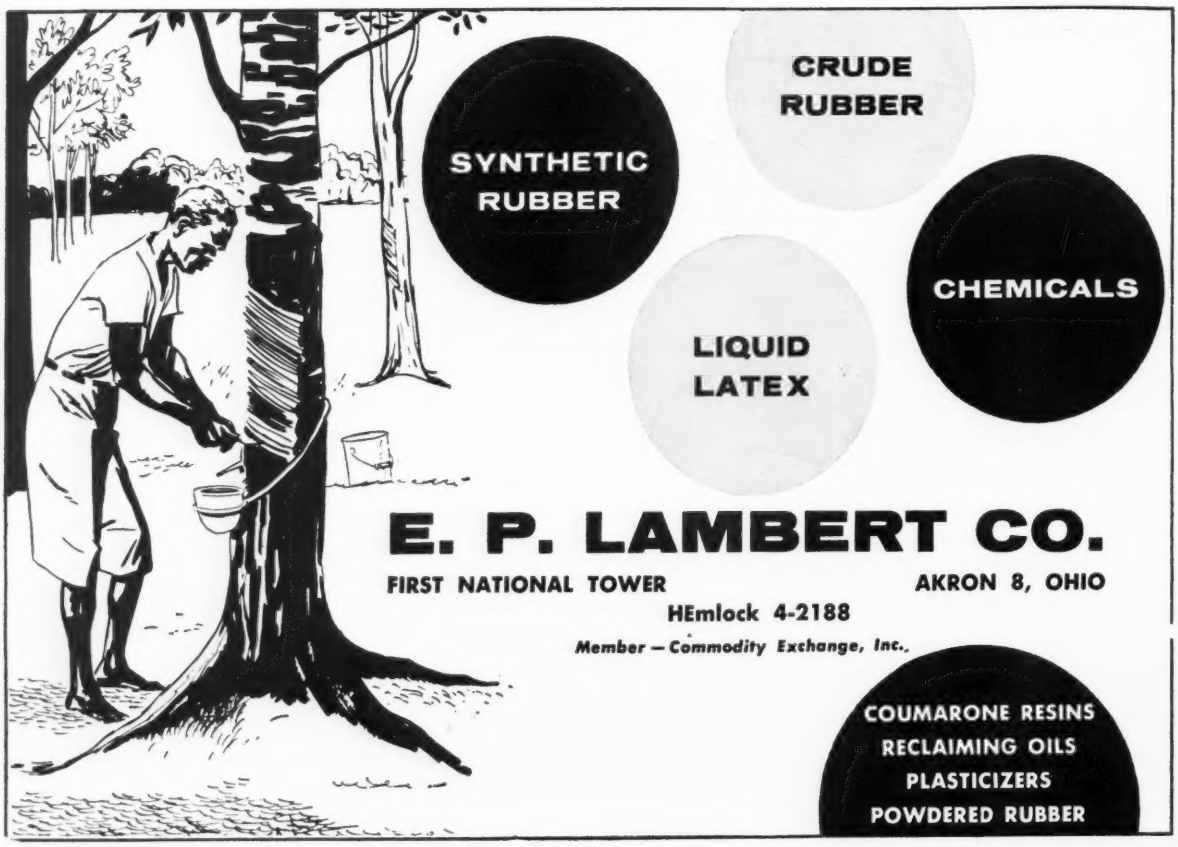
Look
at
Lytron*

*LYTRON REG. U. S. PAT. OFF.

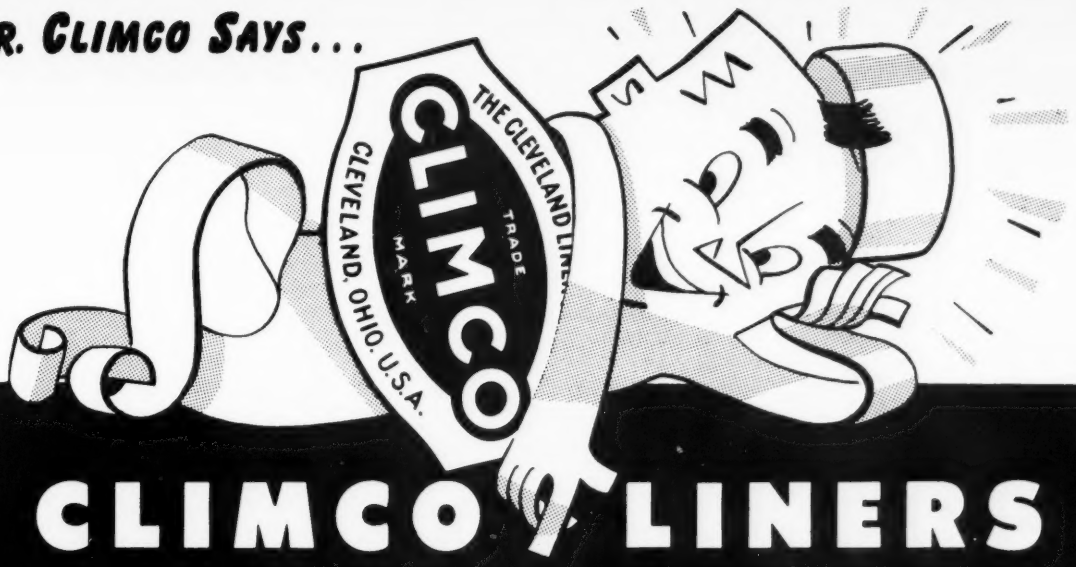
Monsanto supplies a Lytron thickener for every latex or aqueous system!

No other manufacturer offers such a broad and versatile line of thickening agents. Monsanto's Lytrons are 100% synthetic polyelectrolytes. All contribute extremely high viscosity. Lower your costs by obtaining maximum thickening efficiency with minimum amount of Lytron. Supplied in both solid and liquid form. For technical bulletins and free experimental samples, write on your letterhead to Monsanto Chemical Company, Plastics Division, Dept. RW-2, Springfield 2, Massachusetts.

MONSANTO



MR. CLIMCO SAYS...



CLIMCO LINERS

Permit Horizontal Storage of Stock

Horizontal storage is usually easier and more efficient — vertical storage has a tendency to curl the edges of the stock and liner, causing stock losses. When your liners are Climco Processed, you can confidently store them horizontally because the pressure of the roll will not cause sticking.

Climco Processed Liners will help you — whatever your method of storage.

They speed work by stopping stock adhesions and insuring easy separation. The life of your liner is increased, tackiness of the stock is preserved and loss of stock reduced. In addition to these production benefits, Climco Processed Liners protect the stock itself in many important ways.

Since 1922 Climco Processed Liners have proved their worth to the rubber industry. Give them a trial in your plant.

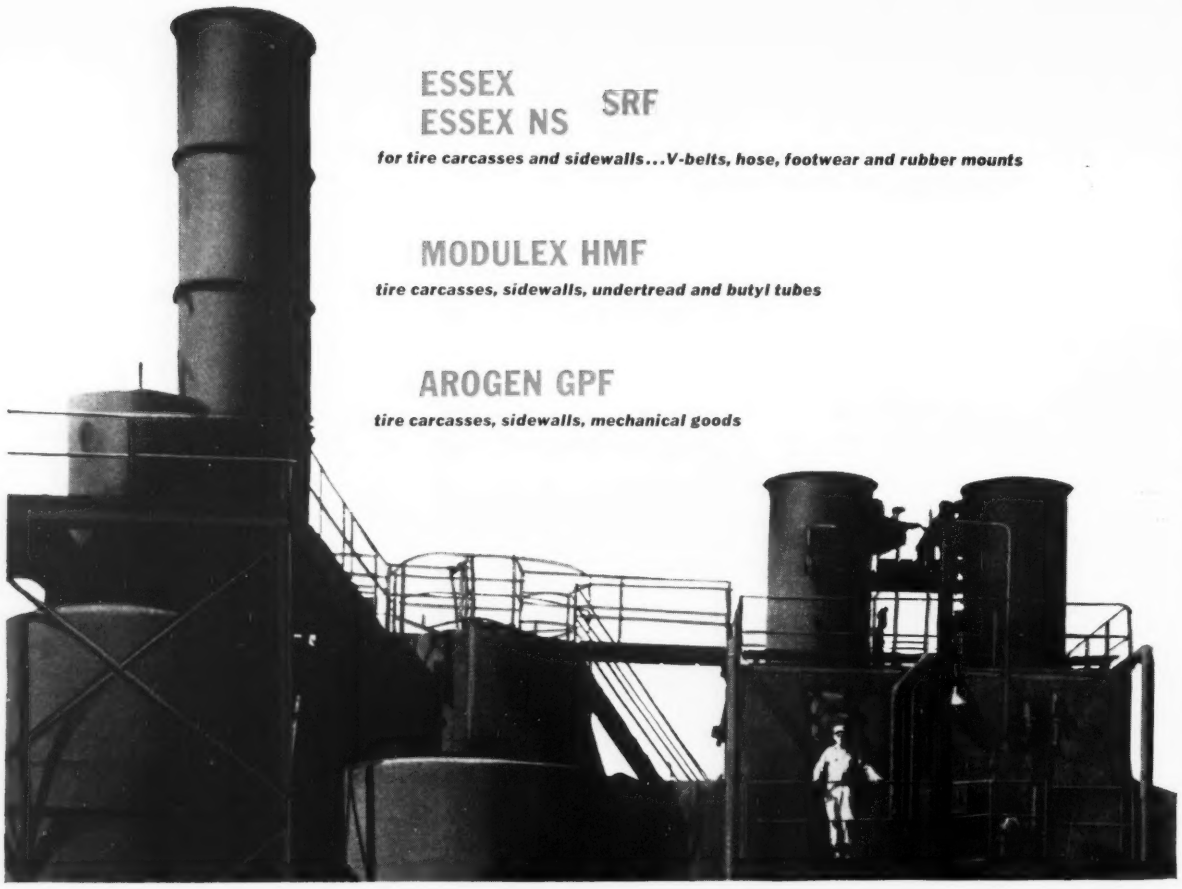
ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio, U.S.A.
Cable Address: "BLUELINER"

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS
Serving the Industry Since 1921



ESSEX
ESSEX NS **SRF**

for tire carcasses and sidewalls...V-belts, hose, footwear and rubber mounts

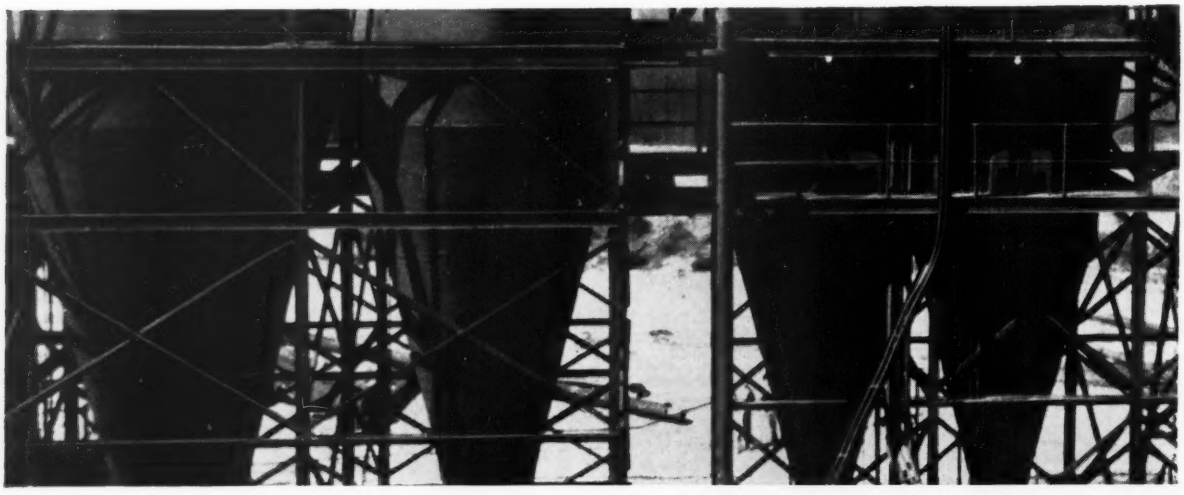
MODULEX HMF

tire carcasses, sidewalls, undertread and butyl tubes

AROGEN GPF

tire carcasses, sidewalls, mechanical goods

for rubber reinforcing pigments, Think of HUBER



HUBER

J. M. HUBER CORPORATION
100 Park Avenue • New York 17, N. Y.
CARBON BLACKS · CLAYS · RUBBER CHEMICALS

general manager
B. BRITTAIN WILSON

editor
ROBERT G. SEAMAN

managing editor
S. R. HAGUE

associate editor
ARTHUR M. MERRILL

assistant editor
MORTON ZELENKO

assistant editor
CHARLES C. ORR

Midwest sales manager
WM. T. BISSON

production manager
M. A. LARSON

circulation manager
M. J. McCARTHY

editorial
advisory board
JOHN BALL
P. D. BRASS
B. H. CAPEN
C. C. DAVIS
J. H. FIELDING
S. D. GEHMAN
LOUIS H. HOWLAND
J. H. INGMANSON
W. E. KAVENAGH
EDWIN B. NEWTON

chairman of board
RAYMOND BILL

president
EDWARD LYMAN BILL

vice presidents
B. BRITTAIN WILSON
C. ERNEST LOVEJOY
WILLIAM H. McCLEARY

treasurer
RALPH L. WILSON

NBP | BPA

SUBSCRIPTION PRICES

United States, $5.00 per year; Canada, $6.00; all other countries, $7.00. Single copies in the U. S., 50¢; elsewhere, 60¢.

OTHER BILL BROTHERS PUBLICATIONS

In marketing, SALES MANAGEMENT, SALES MEETINGS, PREMIUM PRACTICE. In Merchandising, FLOOR COVERING PROFITS, FOUNTAIN & FAST FOOD, GROCER-GRAPHIC, TIRES-TBA Merchandising, YANKEE GROCER. In Industry, PLASTICS TECHNOLOGY.

Copyright February, 1956
By Bill Brothers Publishing Corp.

RUBBER WORLD

FEBRUARY, 1956

VOLUME 133, NUMBER 5

FEATURES

MIXING STUDIES OF PELLETED ZINC OXIDE IN A BANBURY ..... H. C. Jones and E. G. Snyder 651

A 70-30 zinc oxide-rubber masterbatch using pelleted zinc oxide and increased ram pressure is mixed faster with less power to an equal degree of dispersion than when unpelleted zinc oxide is used.

OIL IDENTIFICATION IN OIL-POLYMER MASTERBATCHES FROM ULTRA-VIOLET ABSORPTION SPECTRA ..... D. Prem and J. Duke 659

Aromatic, non-aromatic, or naphthenic oil groups in oils used in extending synthetic rubber may be identified by ultra-violet absorption spectra.

IS THE RUBBER INDUSTRY SPENDING ENOUGH ON RESEARCH? ..... R. G. Seaman 665

An editorial.

"AUTOMATION—RUBBER MANUFACTURING" SYMPOSIUM—II

Akron Group panel on automation in the rubber industry

Fabrication ..... George P. Bosomworth 666
Tire Curing ..... Joseph Torrey 667
Mechanical Goods ..... John Brothers 668

FOURTH SIGNAL CORPS WIRE & CABLE SYMPOSIUM .. 669

Signal Corps Engineering Laboratories, Fort Monmouth, N. J., annual symposium—22 papers.

PANEL DISCUSSION ON BUTYL RUBBER—II

Rhode Island Rubber Club Symposium

Butyl—Wire and Cable Extrusions Emil H. Schwartz 672

DEPARTMENTS

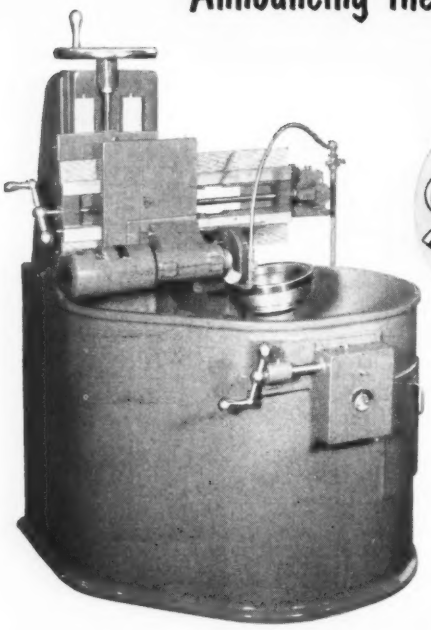
Meetings and Reports	666	New Materials	712
News of the Month		New Products	714
United States	682	Book Reviews	716
Obituaries	700	New Publications	716
Financial	700	Market Reviews	724
News from Aboard	704	Statistics	728
New Equipment	708	Calendar of Coming Events	738

Cover photo, courtesy of New Jersey Zinc Co. (of Pa.).

published monthly by
BILL BROTHERS PUBLISHING CORPORATION

editorial and executive offices
386 Fourth Avenue, New York 16, N. Y.
Chicago office
333 North Michigan Avenue
Midwest office
244 Water Street, Akron 8, O.

Announcing the NEW **HANCHETT**



MODEL **SK-24**

SLITTER KNIFE GRINDER
for
Top or Bottom SLITTERS
WET GRIND

- *finest finishes*
- *extreme accuracy*
- *rigid construction*
- *capacity 3″ to 24″ diameter*
- *semi or fully automatic*
- *positive and accurate fixturing*

HANCHETT MANUFACTURING COMPANY
World's Largest Manufacturer of Knife Grinding and Saw Sharpening Machinery
MAIN OFFICE — Big Rapids, Michigan WEST COAST — Portland 1, Oregon

Trade Mark

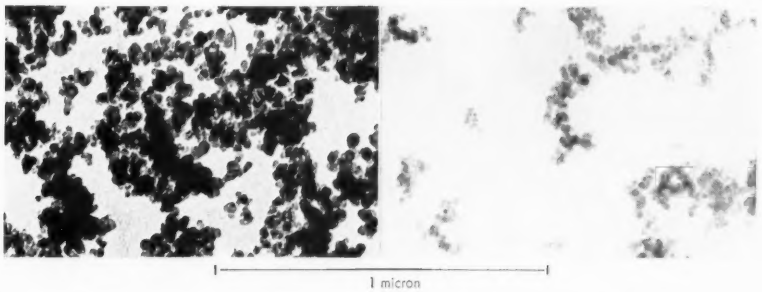
HEVEATEX
CORPORATION
78 GOODYEAR AVENUE
MELROSE 76, MASS.

BRANCHES CHICAGO, ILL. AKRON, O. DETROIT, MICH. LOS ANGELES, CAL.

Natural and Synthetic
Latex and Latex Compounds
for all purposes

And NOW... **CABOT Cab·o·sil®**

The **SAF** *of the Silica Pigments*



Electron Micrograph of Vulcan 9 (SAF) Carbon Black at 50,000 X

Electron Micrograph of Cab-o-sil Colloidal Silica at 50,000 X

Cab-o-sil®, with a finer particle size (0.015-0.020 micron) than even the finest of rubber reinforcing carbon blacks (0.023 micron), has been called the SAF—Super Abrasion Furnace—pigment of the silica field. Cab-o-sil, unique in many respects, is manufactured by a flame process similar to that used for the highly reinforcing (SAF) carbon blacks, and not by an aqueous precipitation process. Fine particle size, with exceptionally high external surface area, results in remarkable stiffening of uncured stocks. Cab-o-sil's remarkable properties include

High Chemical Purity

Extremely Fine Particle Size

Enormous External Surface Area

Unusual Optical Properties

Clean White Color

Startling improvements in rubber—not possible with precipitated silicas, silica gels and aerogels—are realized with the use of only small quantities of Cab-o-sil. Improvements include

Outstanding Tensile Strength

High Elongation

Excellent Tear Resistance

Exceptional Hardness at Low Loadings

Minimum Cold Flow of Uncured Stocks

Good Dielectric Properties

Low Water and Moisture Absorption

TESTED and USED in

Butyl Rubber . . . 5-15 parts of Cab-o-sil per 100 parts of rubber improve the electrical, weather aging and mechanical properties. Due to the low water adsorption of Cab-o-sil, resistance to change of electrical properties after long periods of immersion is especially good. Low loadings can minimize cold flow while helping the extrudability of the stock.

GR-S . . . Light colored compounds containing 5-10 parts of Cab-o-sil and 100 parts of clay per 100 parts of rubber give excellent abrasion and tear resistance.

Neoprene Latex . . . 5-10 parts of Cab-o-sil per 100 parts of rubber substantially increase tensile and tear strength and abrasion resistance in neoprene latices. Dipping operations are more efficient due to reduced drainage time and increased stability of the filled latex. Dispersions of Cab-o-sil in neoprene latices used for dipping operations result in superior tear resistance, higher abrasion resistance and, by reducing drainage, permit the deposition of thicker films.

CHEMICAL and PHYSICAL PROPERTIES

Silica Content (Moisture-Free Basis)	*99.0 - 99.7%*
Free Moisture (105°C.)	*0.2 - 2.0%*
Ignition Loss (1000°C.)	*0.2 - 1.0%*
CaO, MgO	*0.00%*
Fe_2O_3	*0.004%*
Particle Size Range	*0.015 - 0.020 micron*
Surface Area (Nitrogen Adsorption)	*175 - 200 m^2/gm.*
Specific Gravity	*2.1*
Color	*White*
Refractive Index	*1.55*
pH (10% Aqueous Dispersion)	*4.5 - 6.0*
Apparent Bulk Density (Compressed Grade)	*6.0 - 6.5 lbs./cu. ft.*

Cab-o-sil is available in commercial quantities. Send now for a free sample and the bulletins describing Cab-o-sil applications.

CABOT WHITE PIGMENTS DIVISION RW **GODFREY L. CABOT, INC.** 77 FRANKLIN ST., BOSTON 10, MASS.

Please send Cab-o-sil® sample and

- ☐ *Cab-o-sil in Rubber (#cmis-1)*
- ☐ *Aqueous Dispersions of Cab-o-sil (#cmis-2)*
- ☐ *General Properties, Functions and Uses (#cgen-1)*
- ☐ *Cab-o-sil in Plastics (#cpla-2)*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

BRAZE bonding agent

BRAZE cover cement

for Natural Rubber or GR-S

BRAZE cover cement

for Neoprene

THESE RUBBER-TO-METAL BONDING MATERIALS, USED IN THE RECOMMENDED COMBINATION, ARE EFFECTIVE WITH MOST METALS.

BRAZE BONDED RUBBER-TO-METAL COMPONENTS PERFORM WELL IN ALL TYPES OF STATIC AND DYNAMIC SERVICE.

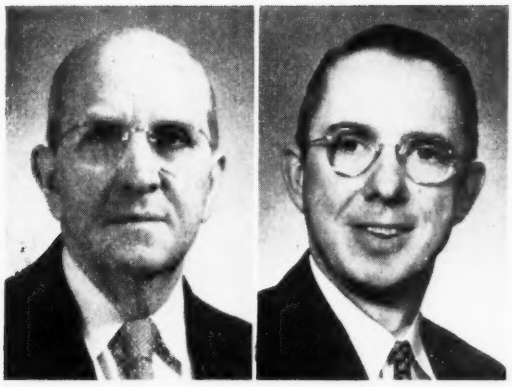
VANDERBILT TECHNICAL SERVICE WELCOMES THE OPPORTUNITY TO ASSIST IN SOLVING YOUR BONDING PROBLEMS.

R. T. Vanderbilt Co., INC. 230 PARK AVENUE, NEW YORK 17, N. Y.

H. Eliard Oliver

RUBBER WORLD

FEBRUARY, 1956



E. G. Snyder H. C. Jones

Mixing Studies of Pelleted Zinc Oxide In a Banbury[1]

By H. C. JONES and E. G. SNYDER

New Jersey Zinc Co. (of Pa.), Palmerton, Pa.

In a 70-30 zinc oxide-rubber masterbatch in a laboratory Banbury mixer, mixing studies with pelleted and non-pelleted zinc oxide show that with adequate ram piston pressure the former is incorporated quicker and with less power consumption than the latter. The mixings were carried to an approximately equivalent degree at dispersion in all cases.

Greater Banbury output was obtained with pelleted zinc oxide at a load factor of 60% and with 50 rather than 32 Mooney viscosity rubber.

The polarity of softeners used influences the instantaneous power requirements of zinc oxide-rubber masterbatches because of variation in wetting characteristics between rubbers containing these softeners and the working surfaces of the internal mixer.

SEVERAL years ago this laboratory reported experiments with the Banbury mixing of zinc oxide in natural and synthetic rubber.[2] This investigation demonstrated that under controlled conditions a laboratory Banbury served as a satisfactory tool for evaluating the mixing properties of zinc oxide in rubber. The determination of the total power consumed, instantaneous power requirements, as measured by an autographic wattmeter, temperature developed in the batch, and the plasticity of the resultant mixing provided the essential observations. The study established that a propionic acid surface-coated zinc oxide required less power, yielded better dispersion, and had improved processing properties over an untreated zinc oxide.

In the current program some of the factors involved in the Banbury mixing of untreated, treated, and densified zinc oxides have been examined. The densified oxide, in pelleted form, has substantially less bulk and occupies less space in an internal mixer than does zinc oxide in the usual pigment form.

Before undertaking a discussion of the present series of experiments, it may be well to call attention to the relative mixing characteristics of different types of zinc oxide on an open mill as compared with an internal mixer. Although this program was limited to a study of zinc oxide, some of the mixing information also applied to the behavior of other pigments in a Banbury mixer.

Pigment incorporation on an open mill is a much less critical operation than in an internal mixer. When the pigment is dumped into the nip of an open mill, the rate of incorporation is slow, and there is relatively little control over the speed with which the pigment is absorbed in the rubber mass. The situation is quite different in the case of the internal mixer where the movement of the rotors folds the pigment into the rubber while developing a high degree of shear. The action of the rotors in the confined space in the Banbury chamber

[1] Presented before the Division of Rubber Chemistry, ACS, Nov. 4, 1955, Philadelphia, Pa.

[2] H. C. Jones, E. C. Snyder, *Ind. Eng. Chem.*, 43, 2602, (1951).

virtually forces the pigment into the rubber mass under pressure. The pressures developed in the chamber of the mixer are dependent upon rotor speed, volume of the material in the chamber, and the applied pressure of the ram which is usually activated by compressed air.

The pressure developed in the Banbury chamber also predensifies some of the zinc oxide before it has an opportunity to be incorporated in the rubber. If the densified pigment is soft, it eventually is incorporated in the mass as a satisfactory dispersed pigment. However, if the pigment tends to be sticky and forms a hard pigment mass in the chamber, the pigment goes into the rubber as hard specks which are not broken up by continued mastication. If the batch is dumped and allowed to cool, sufficient shear may be developed on the second breakdown to disperse the pigment completely. A fatty acid coating uniformly distributed on the surface of the oxide prevents the formation of hard zinc oxide specks, and the second breakdown is usually not necessary. The presence of the fatty acid coating also aids in the pigment-to-rubber wetting and results in a faster incorporation rate for the zinc oxide.

The influence of the surface characteristics of zinc oxide on Banbury mixing properties of zinc oxide is revealed by a densification and screening experiment. Propionic acid-treated zinc oxide and the same pigment untreated were compressed in a hydraulic press under a pressure of 2,000 psi. The compressed disks of zinc oxide were placed on a 35-mesh screen and subjected to the vibrating action of a "Rotap" mechanism.[3] After eight minutes of vibration 50% of the compressed cake of the untreated oxide had broken up and passed through the 35-mesh screen; while in the case of the propionic acid-treated oxide 86% of the compressed oxide had passed through the screen.

These results demonstrate that densification of an untreated zinc oxide produces a much harder mass of zinc oxide than occurs when a treated zinc oxide is subjected to similar compressive forces. The further significance of these experiments in terms of Banbury mixing is that any hard specks that are formed in the internal mixer probably remain as undispersed oxide in the rubber mass. In the case of a coated zinc oxide, the soft lumps of zinc oxide readily break up during the mixing of the rubber composition.

[3] A testing sieve shaker made by W. S. Tyler Co., Cleveland, O.

A study has been made of the Banbury mixing characteristics of several zinc oxides in a 70-30 zinc oxide-rubber masterbatch. The experiments were conducted in a No. 00-size Banbury with a 4,300 cc. free volume. The unit was equipped with a hopper which facilitated the one-shot mixing operation in which the rubber and the zinc oxide were charged simultaneously into the mixer. All of the mixings were done by this one-shot method in which the rubber was charged into the hopper first, with the zinc oxide on top of the rubber. The ram was then lowered. An Esterline graphic wattmeter and a Westinghouse integrating watthour meter for the power measurements were described in the previous paper.[2]

Effect of Ram Pressure

The mixing investigation included the examination of the following three zinc oxides; zinc oxide-A (XX-4[4]), an American process type; zinc oxide-B (Protox 167[4]), an American process type treated with propionic acid and a light processing oil; and zinc oxide-C (Protox 267[4]) which is the same as zinc oxide-B, but in addition has been subjected to a pelleting treatment to reduce the bulking characteristics of the oxide.

American process oxides are derived directly from the ore. These brands contain controlled amounts of basic sulfates that impart specific properties to natural and synthetic rubber compounds. French process oxides are derived from metal and are characterized by high chemical purity.

The influence of ram pressure on the mixing properties of the three oxides in GR-S 1004 type rubber is indicated in Table 1 where the mixings were made at 85° C. This is the temperature of the water that is circulated through the Banbury jacket. The rubber temperatures listed in the tables are measured by a thermocouple mounted in a steel tube in the Banbury chamber that projects down into the rubber mass. At ram piston pressures of 40 and 60 psi. the pelleted oxide, zinc oxide-C, consumed much less power and had a considerably shorter mixing cycle than zinc oxide-B; while at 20 psi. ram piston pressure the two zinc oxides were in the reverse order with regard to power consumption and mixing time. Presumably, when there is adequate ram piston pressure, the pelleted oxide is forced into

[4] N. J. Zinc Sales Co., New York, N. Y.

TABLE 1. GR-S TYPE RUBBER MIXINGS AT 85° C. (185° F.)—WITHOUT STEARIC ACID

Zinc Oxide	Ram Piston* Pressure Psi.	Mixing Time Minutes	Watt-Hours	Temperature °C.	Temperature (°F.)	Ram Down Minutes	Banbury Grading	Mooney Plasticity ML/212° F. 5 Minutes
A	20 (11.5)	16	1540	130	(266)	12	7—	98
B	20 (11.5)	4	685	129	(264.2)	2	9	77
C	20 (11.5)	5.5	887	136	(276.8)	4	8+	77
A	40 (23)	17	2480	134	(273.2)	1	8+	91
B	40 (23)	7	1082	133	(270.9)	1	8+	76
C	40 (23)	3.5	620	127	(260.6)	2	9	73
A	60 (34.5)	21	3090	134	(273.2)	1	7+	74
B	60 (34.5)	9	1392	133	(270.9)	0.5	8+	77
C	60 (34.5)	2.5	464	108	(226.4)	1.5	8—	88

*Figures in parentheses are actual pressures on the ram face. The piston ram pressures are the gage pressures on the piston which activates the ram.

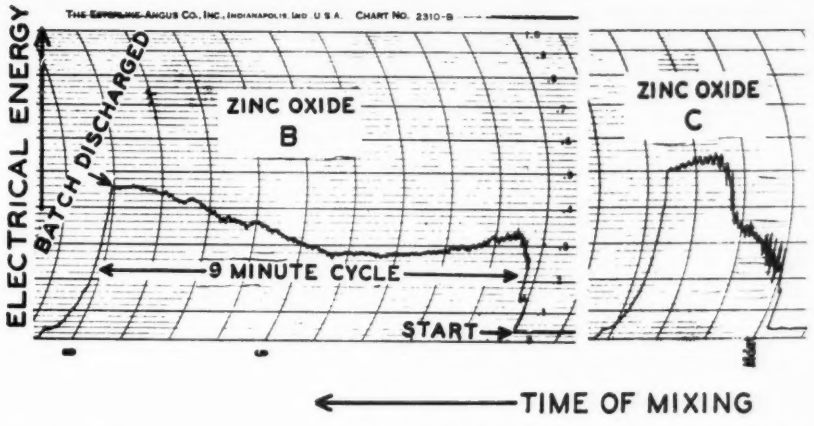


Fig. 1. Banbury power consumption for 70-30 zinc oxide-GR-S 1004 type rubber masterbatch mixing with zinc oxide-A and zinc oxide-B. Banbury temperature 85° C. (185° F.); 60 psi. ram piston pressure; and 60% load factor mixing conditions

the rubber faster than the non-pelleted oxide. With a minimum ram piston pressure of 20 psi. the non-pelleted oxide is taken up more readily by the rubber.

The untreated base oxide, zinc oxide-A, in every instance required more power and a longer mixing time than the two forms of the treated oxide. The position of the ram during the mixing cycle gives some indication of the relative mixing behavior of the oxides. At the higher ram piston pressures the non-pelleted oxides sifted around the ram so that in a short time the pigment was above rather than below the ram. The pelleted oxide, zinc oxide-C, however, remained beneath the ram during the entire mixing operation. This fact probably accounts for the much shorter mixing cycle required for the pelleted oxide than the non-pelleted oxide.

An arbitrary visual grading of the pigment dispersions in the Banbury batches is shown in Table 1 where a grading of 10 is a perfect dispersion and a 7— is a minimum acceptable dispersion grade. The method[5] is based on a pellet count, and the addition of a few grams of carbon black gives a sufficient contrast so that the undispersed white specks stand out in contrast to the gray background. It will be noted that both forms of the treated oxide, zinc oxide-B and zinc oxide-C, have better dispersion properties than the untreated oxide, zinc oxide-A.

The ram piston pressures are expressed in gage or unit pressure on the piston which activates the ram. In terms of the pressure on the ram face which has more practical significance the values of 20, 40, and 60 psi. become 11.5, 23, and 34.5 psi., respectively.

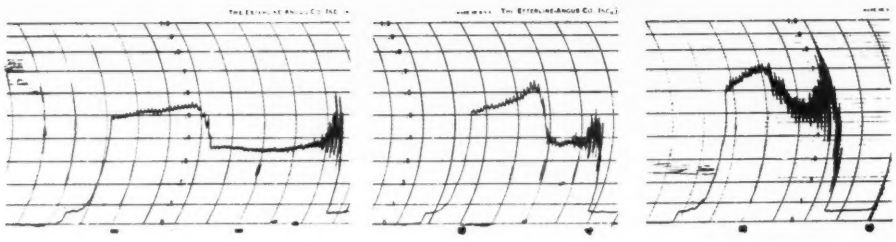
An examination of the power curves for zinc oxide-B and zinc oxide-C in mixings at 85° C. (185° F.) further reveals the nature of the mixing operation (Figure 1). The power chart reads from right to left so that the beginning of the cycle is on the right side of the chart. It will be observed that the power curve for zinc oxide-C is made up of two parts, each of approximately equal duration. The first portion of the curve is jagged, showing sharp power fluctuations followed by a sudden increase in power consumption and a continuation at the higher power level with only slight variations in power during the remainder of the cycle.

The interpretation of this curve is that during the initial phase of the cycle there is a cutting and shredding of the rubber, and as the cycle progresses, pigment is spread over the surface of the small particles of rubber. In the range between one-half to one minute or more, the batch has a sandlike consistency, with the rubber particles the internal phase and the pigment the external phase. This fact has been established by dumping such batches after one or two minutes' mixing. Finally, the batch masses, and the mixing is completed at the higher power level. As indicated by the ram position, all of the pelleted oxide is under the ram during the entire mixing cycle.

The power curve and mixing characteristics for incorporation of zinc oxide-B in GR-S type rubber differ widely from those for zinc oxide-C. With zinc oxide-B there are some cutting and shredding of the rubber during the first few seconds of the mixing cycle. The batch then masses, and the pigment incorporation proceeds at a relatively slower rate. As the pigment sifts from above the ram, the increase in batch size calls for a greater power requirement, and this is indicated by the gradual increase in power consumption. It is to be remembered that in these mixings all of the zinc oxide and the rubber are charged at one time, and the ram is lowered. The load factor is 60%; that is, the volume of pigment and rubber is equal to 60% of the volume of the mixer.

There may be some question as to how the operator determines the end-point of the mixing operation. With a little experience he is able to ascertain when the pigment is completely incorporated in the rubber mass, by sliding a steel spatula alongside of the ram and in this fashion determine whether the pigment is completely incorporated in the rubber. In most instances the mixings have been repeated and have been found to give good reproducibility, as indicated by the pigment dispersions, power and temperature observations.

[5]When the batch is discharged from the Banbury, it is massed on a sheet-off mill. In order to obtain a satisfactory section for examination, the batch is stored overnight. The batch is then cut with a large knife, and the total number of macroscopic specks visible under a standard light source is taken as the dispersion index.



RAM PRESSURE PSI.	70	90	90
GR-S 1004			
PREMASTICATED MIN.	30	30	0
MOONEY VISCOSITY	32	32	51.5
MIXING TIME MIN.	7	4	3.5
POWER W-HR.	1305	834	905
TEMPERATURE °C.	145	134	138
BANBURY GRADING	9+	9-	9+

MIXING TEMP. 85°C.
WITHOUT STEARIC ACID
MIXINGS AT 69 RPM

Fig. 2. Banbury power consumption for 70-30 zinc oxide-GR-S type rubber masterbatch mixing with zinc oxide-C at 70% load factor

TABLE 2. GR-S MIXINGS AT 85° C. (185° F.)—WITH 2% STEARIC ACID

Zinc Oxide	Ram Piston* Pressure Psi.	Mixing Time Minutes	Watt-Hours	Temperature °C.	Temperature (°F.)	Ram Down Minutes	Banbury Grading	Mooney Plasticity ML/212° F. 5 Minutes
A	20 (11.5)	19	1990	129	(264.2)	9.5	7	83
B	20 (11.5)	4.5	707	121	(249.8)	1.5	8	55
C	20 (11.5)	8	1005	124	(255.2)	6.5	9+	59
A	40 (23)	20.5	2775	131	(267.3)	3	9	68
B	40 (23)	10.5	1660	136	(276.8)	1	8	64
C	40 (23)	3	502	118	(244.4)	2	8+	53
A	60 (34.5)	24	3240	130	(266)	2	8	65
B	60 (34.5)	18	2510	136	(276.8)	1	9+	69
C	60 (34.5)	3	520	119	(246.2)	2	8+	59

*Figures in parentheses are actual pressures on the ram face. The piston ram pressures are the gage pressures of the piston which activates the ram.

Effect of Stearic Acid and the Temperature of Mixing

A similar set of mixings was made with 2% stearic acid added to the GR-S 1004 type rubber batches, and the results are listed in Table 2. The stearic acid was charged into the mixer along with the zinc oxide. As in the previous series, the pelleted oxide, zinc oxide-C, required more power and a longer mixing time than the non-pelleted oxide, zinc oxide-B, at 20 psi. ram piston pressure. When the ram piston pressure was increased to 40 and 60 psi., however, the pelleted oxide, zinc oxide-C, had a much shorter mixing cycle and a lower power consumption than the non-pelleted pigment, zinc oxide-B. Somewhat more power was needed for the mixing of the batches with stearic acid than those without stearic acid in the case of the non-pelleted oxides, zinc oxide-A and zinc oxide-B.

When the ram piston pressure was increased to 70 psi., it was possible to increase the loading to 70% load factor with the pelleted oxide, zinc oxide-C. Owing to the bulk of the non-pelleted oxides, they could not be loaded beyond the 60% level in the one-shot mixing operation. The data in Figure 2 show that mixing time and power consumption can be further reduced at the 70% loading level by increasing the ram piston pressure to 90 psi. The influence of masticated and unmasticated GR-S type rubber at this ram piston pressure and loading level is noteworthy. Mixing time was reduced from 4.0 to 3.5 minutes with the unmasticated polymer. In other words, it appears advantageous to use a higher Mooney viscosity rubber as the upper loading limits of the mixer are approached.

High Rotor Speed (137 RPM.)

Modern mixing practices have tended toward higher Banbury rotor speeds in order to attain a maximum of production on a given unit. The three zinc oxides were compared in master-batches mixed at 137 rpm., and the results are listed in Tables 3 and 4. The previous mixings were made with a 69 rpm. rotor speed.

TABLE 3. HIGH-SPEED (137 RPM.) MIXINGS IN GR-S 1004 TYPE RUBBER—BANBURY TEMPERATURE, 40° C. (104° F.)

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)	Ram Down Min.	Banbury Grading	Mooney Plasticity ML/212° F. 5 Min.
			Without Stearic Acid			
A	9.5	3100	149 (300.2)	1.0	5	77
B	3.5	1358	141 (285.6)	1.0	8	74
C	1.5	610	102 (215.6)	1.0	7+	72
			With 2% Stearic Acid			
A	7.5	2290	143 (293)	0.25	9+	70
B	4.5	1542	142 (287.6)	1.0	8+	60
C	2.5	854	120 (248)	1.5	7+	57

Note: Ram piston pressure, 60 psi; pressure on face of ram, 34.5 psi.

TABLE 4. HIGH-SPEED (137 RPM.) MIXINGS IN GR-S 1004 TYPE RUBBER—BANBURY TEMPERATURE, 85° C. (185° F.)

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)	Ram Down Min.	Banbury Grading	Mooney Plasticity ML/212° F. 5 Min.
			Without Stearic Acid			
A	9.5	2535	159 (318.2)	1.0	8—	80
B	4.5	1370	158 (316.4)	1.0	9	84
C	2.5	940	149 (300.2)	1.0	9	73
			With 2% Stearic Acid			
A	16	3650	156 (312.8)	3.0	8—	71
B	12	3165	158 (316.4)	0.5	9—	65
C	2.5	786	137 (278.6)	1.0	9	57

Note: Ram piston pressure, 60 psi.; pressure on face of ram, 34.5 psi.

Mixes at 40° C. (104° F.)

The influence of stearic acid on the mixing characteristics of the three zinc oxides mixed at 40° C. (104° F.) was very pronounced (Table 3). Without stearic acid added to the batch, the treated oxides, zinc oxide-B and zinc oxide-C, incorporated faster and with less power than the corresponding batches with 2% stearic acid. The pelleted pigment, zinc oxide-C, was mixed in a minimum time of 1.5 minutes. However, in the case of the untreated pigment, zinc oxide-A, the presence of the stearic acid substantially lowered mixing time and power requirements. The dispersion of zinc oxide-A was substantially upgraded as a result of the presence of the fatty acid.

This series of data emphasizes the importance of the carboxyl group in the GR-S type rubber batch and further points to the desirability of having the organic acid present as a coating on the surface of the zinc oxide where it imparts a maximum effect. The propionic acid coating reduces mixing time and power consumption and results in improved dispersion. The advantage for propionic acid over the longer chain acids is that it is more effective per unit weight of the organic acid because of its lower molecular weight. Furthermore propionic acid does not soften the rubber as much as the longer chain fatty acids. Somewhat higher temperatures are developed at 137-rpm. rotor speed than 69 rpm. where satisfactory mixing of zinc oxide-A at the lower mixing temperature was possible.

Mixes at 85° C.

When the mixing temperature was increased to 85° C. (185° F.), more power and a longer mixing time were required for the batches of zinc oxide-A and zinc oxide-B with stearic acid than without the fatty acid (Table 4). The pelleted oxide, zinc oxide-C, however, consumed less power in mixing with stearic acid than without the organic acid.

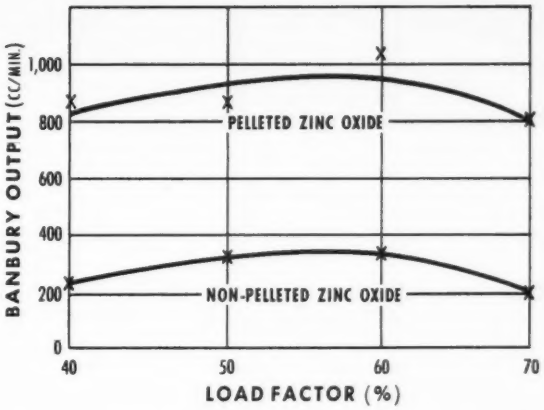


Fig. 3. Comparison of Banbury outputs obtained with pelleted and non-pelleted zinc oxide at various load factors in 70-30 zinc oxide-GR-S type rubber masterbatch

It is of noteworthy interest that all the masterbatches with zinc oxide-C, the pelleted oxide, had consistently lower Mooney viscosity values than the non-pelleted oxides, zinc oxide-A and zinc oxide-B. These observations were made in batches both with and without stearic acid in millings at 40 and 85° C. (Tables 3 and 4). Why the pelleted oxide should yield lower viscosities than the non-pelleted oxide is not understood, particularly since the pelleted oxide was mixed in a shorter mixing cycle, and, therefore, less total power was consumed in the mixing of this pigment.

Pelleted Zinc Oxide Increases Banbury Output

The advantages of the pelleted over the non-pelleted zinc oxide from the standpoint of Banbury output is demonstrated in the data in Tables 5 and 6 and the curves in Figure 3.

In the mixing of the 70-30 zinc oxide-GR-S type rubber masterbatches, a substantially higher Banbury output was possible with the pelleted pigment zinc oxide-C than with the non-pelleted pigment zinc oxide-B over a range of loadings from 40 to 70% load factor. It is significant that for a mixing of this type, the highest output for both oxides was obtained with a 60% load factor. Furthermore, the merits of the pelleted oxide were more apparent with the 50 than with the 32 Mooney viscosity GR-S type rubber. Presumably, the greater internal pressure developed at the higher load factor requires a stiffer rubber for the best mixing behavior. The mixing limitations of the bulky non-pelleted pigment at a high loading is demonstrated by the behavior of zinc oxide-B in the mixing at 70% load factor and 60 psi. ram piston pressure. Table 5 lists the mixing time for the two oxides at 60 and 90 psi. ram piston pressure, together with the Banbury output in cubic centimeters per minute.

The power consumption requirements and dispersion

TABLE 5. STUDY OF BANBURY OUTPUT—MIXING TIMES AND VOLUMES

Pelleted and Non-Pelleted ZnO-GR-S Type Rubber Mixings at 40° C. with Stearic Acid—69 RPM.

Load factor, %	40	50	60	70
Vol. displacement of banbury—ccs.	1720	2150	2580	3010
Mixing Time—32 Mooney Viscosity GR-S Type Rubber				
60 Psi. Ram Piston Pressure				
ZnO-B, min.	7.5	7.0	8.0	*15.0
ZnO-C, min.	2.0	2.5	4.0	9.0
90 Psi. Ram Piston Pressure				
ZnO-C, min.	—	—	2.5	6.0
With 50 Mooney Viscosity GR-S Type Rubber				
ZnO-C, min.	—	—	—	4.5
Banbury Output per Minute				
60 Psi. Ram Piston Pressure				
ZnO-B, ccs.	230	310	325	200
ZnO-C, ccs.	860	860	645	335
90 Psi. Ram Piston Pressure				
ZnO-C, ccs.				
32 Mooney viscosity	—	—	1035	500
ZnO-C, ccs.				
50 Mooney viscosity	—	—	—	670

*Zinc oxide-B feeds into the mixing chamber by sifting around the ram. After 14 minutes the stock became soft and sealed off the space around the ram so that the oxide would no longer feed into the chamber. The ram was raised to permit the oxide to feed.

TABLE 6. STUDY OF BANBURY OUTPUT—POWER CONSUMPTION (69 RPM.) AND DISPERSION GRADINGS

(This tabulation lists the power consumption requirement and dispersion gradings of the mixings in Table 5.)

Load factor, %	40	50	60	70
60 Psi. Ram Piston Pressure				
ZnO-B, total watt-hrs.	843	1090	1545	3000
Watt-hrs./min.	113	151	193	200
Banbury grading	9	8+	9+	9
ZnO-C, total watt-hrs.	280	465	744	1520
Watt-hrs./min.	140	186	186	169
Banbury grading	7	9	9	8
90 Psi. Ram Piston Pressure				
ZnO-C, total watt-hrs. (32 Mooney visc. RS)	—	—	620	1280
Watt-hrs./min.	—	—	248	213
Banbury grading	—	—	9+	9
ZnO-C, total watt-hrs. (50 Mooney visc. RS)	—	—	—	1100
Watt-hrs./min.	—	—	—	245
Banbury grading	—	—	—	9+

gradings for these batches are shown in Table 6. The total power consumption requirements for zinc oxide-B are somewhat greater than that for zinc oxide-C owing to the longer mixing cycles for the non-pelleted oxide. When these values were converted to watt hours per minute of mixing time, zinc oxide-C consumed less power per unit of time at the higher loading conditions than zinc oxide-B. All of the dispersions were good except the pelleted oxide mixing at 40% load factor. It appears that sufficient internal pressure was not developed in the chamber at this loading to break up and disperse the pelleted oxide.

Some mention should be made of high-pressure Banbury mixing. Actually any change in the mixing operation which increases the working pressure within the chamber is a move in the direction of high-pressure

TABLE 7. NATURAL RUBBER MIXINGS AT 69 RPM.

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)	Ram Down Min.	Banbury Grading	Mooney Plasticity ML/212° F. 5 Min.
Mixings at 40° C.						
B	5	907	99 (210.2)	0.5	9	49
C	3	540	88 (190.4)	1.5	9	50
Mixings at 85° C.						
A	17	2455	140 (284)	1.5	9—	44
B	8.5	1300	132 (268.6)	0.5	9—	41
C	3	495	113 (235.2)	1.5	8+	53

Pressure on the ram, 60 psi.; actual pressure on ram face, 34.5 psi.

TABLE 8. NATURAL RUBBER MIXINGS AT 137 RPM.

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)	Ram Down Min.	Banbury Grading	Mooney Plasticity ML/212° F. 5 Min.
Mixings at 40° C.						
A	7.5	2230	150 (302)	0.75	8	48
B	4	1295	132 (268.6)	0.50	10—	38
C	2.5	842	118 (244.4)	1	9	41
Mixings at 85° C.						
A	7	1962	161 (321.8)	0.50	9+	43
B	4.5	1340	159 (318.2)	0.50	10—	35
C	2.5	827	140 (294.8)	0.50	9	39

Ram piston pressure, 60 psi.; actual pressure on ram face, 34.5 psi.

mixing. Higher ram pressure, a greater rotor speed, or a larger volume of stock in the chamber will singly or collectively tend toward high-pressure mixing conditions.

Aside from the greater output of milled stock, high-pressure mixing makes possible better pigment dispersion because of the greater shear developed in the chamber. In this connection it should be kept in mind that the limitation of high-pressure mixing is the viscosity of the original polymer.

High pressures mean nothing unless the batch is stiff enough to resist and work against the applied pressure of the rotor and ram. This feature is exhibited in the autographic chart in Figure 2 where the full advantage of the high ram pressure is realized, when 32 Mooney viscosity rubber is replaced with 50 Mooney viscosity rubber.

Pigment masterbatches because of their greater stiffness lend themselves more readily to high-pressure mixing than fully compounded direct mixed Banbury stocks.

Mixing Experiments with Natural Rubber

Premasticated smoked sheet rubber was used in the masterbatches listed in Table 7. The pelleted oxide, zinc oxide-C, was incorporated in a three-minute cycle and required considerably less power than zinc oxide-B in both mixings at 40 and 85° C. In a comparison with similar mixings in GR-S 1004 type rubber, the natural rubber mixings required less power than the synthetic rubber masterbatches.

The natural rubber batches were also mixed at the higher mixing speed, 137 rpm., and the results are shown in Table 8. Again the natural rubber mixings consumed less power than the corresponding GR-S type

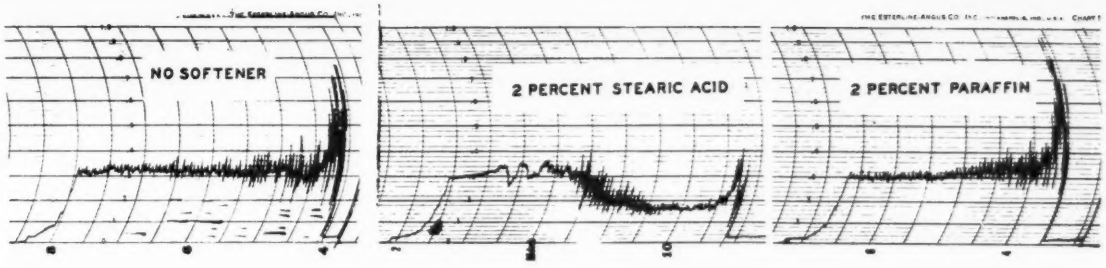


Fig. 4. Effect of polar and non-polar softeners on power consumption in Banbury mixing of 70-30 zinc oxide-smoked sheet masterbatch. Banbury temperature 40° C. (104° F.); ram piston pressure, 20 psi.; and load factor 50% mixing conditions

TABLE 9. GR-S TYPE RUBBER AND SMOKED SHEET MIXINGS AT 85° C.

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temperature °C. (°F.)	Ram Down Min.
		GR-S1004 Type Rubber		
A	16	3650	136 (276.8)	3.0
B	12	3165	138 (280.4)	0.5
A*	4.5	1172	145 (293)	1
B*	4.5	1350	151 (303.8)	1
		Smoked Sheet		
A	7.0	1962	161 (321.8)	0.5
B	4.5	1340	159 (318.2)	0.5

Piston ram pressure, 60 psi.; actual ram face pressure, 34.5 psi. Mixings at 137 rpm.
*Ram raised and lowered at one-minute intervals.

TABLE 10. BUTADIENE ACRYLONITRILE (HIGH ACRYLONITRILE CONTENT) RUBBER MIXES

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)
	50 Zinc Oxide-50 Polymer		
A	3.0	577	125 (256)
B	2.5	490	118 (244.4)
C	2.5	502	118 (244.4)

85° C. Banbury temperature.
40 psi. ram piston pressure; actual pressure on ram face, 23 psi.
50% load factor.

TABLE 11. NEOPRENE TYPE-W RUBBER MIXES

Zinc Oxide	Mixing Time Min.	Watt-Hrs.	Temp. °C. (°F.)
	50 Zinc Oxide-50 Polymer		
A	5.5	958	118 (244.4)
B	2	379	88 (190.4)
C	2	386	90 (194.0)

40° Banbury temperature.
40 psi. ram piston pressure; actual pressure on ram face, 23 psi.
50% load factor.

rubber batches, except in the case of zinc oxide-C mixed at 85° C. Substantially more power was required for the mixing of zinc oxide-A and zinc oxide-B in GR-S type rubber than smoked sheet rubber in both 69 and 137 rpm. mixings at 85° C.

The mixing limitation, under the above conditions, of zinc oxide-A and zinc oxide-B in GR-S type rubber at 85° C. is partially indicated by the results in Table 9. Zince oxide-A required 16 minutes, and zinc oxide-B required 12-minutes in the regular one-shot mixing. By raising and lowering the ram at one-minute intervals, the mixing cycle was reduced to 4.5 minutes, indicating that the non-pelleted oxide did not feed into the mixing chamber at the elevated temperature.

With smoked sheet rubber there was no evidence of feeding difficulties with the non-pelleted oxide. It was suspected that the delayed mixing of zinc oxide-A and zinc oxide-B in GR-S type rubber at 85° C. might be due to the evolution of gas from the rubber at the elevated temperature. Any appreciable gas pressure developed in the rubber could retard the incorporation of pigment until most of the gas was eliminated. The incorporation of the pelleted oxide was not delayed since this pigment remained under the ram and therefore was under a constant pressure during the entire mixing cycle. It will be recalled from the earlier discussion, however, that the non-pelleted oxide worked up around the ram so that the pigment was not under constant pressure. Under these conditions any gases coming off the rubber might be expected to retard pigment incorporation.

The Influence of Polar and Non-Polar Plasticizers on Mixing

A fine particle size French process oxide[6] was evaluated in the 70-30 zinc oxide smoked sheet masterbatch (a) without stearic acid, (b) with 2% stearic acid, and (c) with 2% paraffin. The plasticizers were added with zinc oxide in the one-shot mixings.

There was a high initial power surge in the mixing without stearic acid (Figure 4) when the ram was lowered, suggesting that the batch "takes hold" immediately. With 2% stearic acid there was no evidence of a power surge, indicating that the fatty acid has lubricated the surface of the rotor and chamber walls, and there is slippage until the fatty acid is absorbed in the rubber batch. The paraffin addition to the batch produces a power surge similar to that of the mix without stearic acid. Although paraffin has distinct lubricating properties, it is non-polar and therefore does not form an interfacial layer on the steel rotor and chamber surfaces.

These observations were further supported by experiments in which the plasticizers, stearic acid, and paraffin were introduced by spraying the rotor and chamber surfaces with benzene solutions of stearic acid and paraffin. The experiments serve to demonstrate the influence of surface wetting characteristics on the power requirements of mixing. The steel rotors and shell of the mixer are organophylic, and the metal

[6] Kadox 15, N. J. Zinc Sales Co.

surfaces are readily wet by the rubber batch, hence the sudden "taking hold" of the rubber batch and the high initial power surge. When stearic acid is introduced with the pigment, it quickly wets the steel surfaces and forms an interfacial layer which lubricates the rotor and walls, and there is slippage until the organic acid is absorbed in the batch. The paraffin has no surface wetting characteristics and consequently does not influence the power curve.

N. F. Miller[7] reported on the wetting of steel surfaces by fatty acids. This investigator stated that regular steel is organophylic when polished, and that the rougher the surface, the less noticeable the wetting characteristics. Certainly the highly polished surfaces of the rotor and the chamber would show a pronounced surface effect.

Masterbatches of 50-50 zinc oxide-butadiene acrylonitrile rubber (Table 10) and zinc oxide-Neoprene Type W rubber were prepared (Table 11). The surface-treated grades zinc oxide-B and zinc oxide-C had a shorter mixing cycle in both polymers than the untreated pigment zinc oxide-A.

High Loadings Necessary for Evaluation

A rubber technologist may justifiably raise the question as to why a 70-30 zinc oxide-rubber masterbatch is used as the basis of the investigation since this loading would tend to exaggerate differences between several zinc oxides which might not be apparent at the lower ZnO level where most stocks are compounded. Certainly the differences between the oxides are magnified as a result of the high zinc oxide-to-rubber ratio.

Some thought must be given, however, to the relative shear differences developed in laboratory and plant-scale mixing equipment. Under almost any test conditions the high degree of shear developed in a laboratory mixer tends to minimize mixing and dispersion differences between pigments. The opposite is more likely to be the case with factory scale mixers, particularly when operating under less favorable conditions with regard to batch size, mixing time, and rotor clearances in a well-worn mixer. Hence it is the belief that the performance of a high zinc oxide masterbatch in a laboratory mixer may provide some useful information with regard to the behavior of normal loadings of zinc oxide in commercial rubber stocks in a factory-scale Banbury operation.

The incorporation of pigments in butyl rubber is recognized as requiring somewhat more skill than the pigmentation of natural rubber or many synthetic polymers. It might be expected for this reason to be a suitable medium for the study of a direct mixed commercial stock involving zinc oxide pigmentation.

The data in Table 12 list a series of 10 zinc oxides compounded in 25-part loadings in a butyl airbag formula. The Enjay Butyl 150[8] compound is pigmented with a blend of furnace black, clay, and zinc oxide. Included in the group of oxides are several types of zinc oxides of a range of particle sizes. Treated, untreated, pelleted, and non-pelleted forms of the pigment were in the list.

TABLE 12. BANBURY MIXING OF A BUTYL AIRBAG FORMULA WITH 25 PARTS OF ZINC OXIDE

Zinc Oxide	Watt-Hrs.	Final Temp. °C. (°F.)	Banbury Grading
American Process			
Untreated (Protox XX-4)	599	92.5 (198.5)	7
Treated (Protox 167)	599	94.5 (202.1)	9—
Treated (Protox 167)	620	93 (199.4)	9—
Treated (Protox 167)	612	94 (201.2)	9—
Treated and pelleted (Protox 267)	613	94 (201.2)	9—
French Process			
Untreated coarse (XX-78)	600	93 (199.4)	9—
Intermediate (Kadox 72)	602	94 (201.2)	8+
Fine (Kadox 15)	598	94 (201.2)	5
Treated Intermediate (Protox 168)	598	97 (206.4)	8+
Fine (Protox 169)	588	93 (199.4)	8+

Formula	
Enjay Butyl 150	100
Zinc oxide	25
MAF carbon black	30
Clay	30
Resin	3
Mineral oil	5

Sulfur and accelerators added on the sheet-off mill.

50% load factor.
40° C. temperature.
40 psi. ram piston pressure; actual ram face pressure, 23 psi.

It is significant that with 25 parts of zinc oxide, dispersion differences are quite apparent and fit the accepted pattern with regard to particle size and nature of the surface particle involved, but that at this pigmentation level the power consumption and temperature developed in the batches are essentially equal. The carbon black and clay content of the stock dominate the power consumption determination. These data support the contention that the loading conditions must be exaggerated in the laboratory-scale mixings in order to bring out processing differences of zinc oxides which are known to exist in factory-scale mixing.

Summary and Conclusions

Power consumption experiments with 70-30 zinc oxide-rubber masterbatches in a one-shot mixing cycle in a laboratory Banbury are reported.

When there was adequate ram piston pressure, a pelleted zinc oxide incorporated in GR-S and natural type rubbers in a much shorter time and with lower power consumption than a similar oxide in a non-pelleted form. At low ram piston pressures the non-pelleted oxide was absorbed in rubber faster than the pelleted type.

Greater Banbury output was obtained with pelleted zinc oxide at a load factor of 60%. The merits of pelleted zinc oxide in this connection were more apparent with 50 than with 32 Mooney viscosity GR-S type rubber.

Polar and non-polar softeners had a marked influence on the instantaneous power requirements of the zinc oxide-rubber masterbatches owing to the interfacial wetting characteristics between the rubber and the working surfaces of the internal mixer.

[7] *J. Phys. Chem.*, 50, 300 (1946).
[8] Enjay Co., Inc., New York, N. Y.

Oil Identification in Oil-Polymer Masterbatches from Ultra-Violet Absorption Spectra[1]

By D. PREM and J. DUKE

University of Akron, Government Laboratories, Akron, O.

Identification of the oils present in 30 oil-polymer masterbatches was attempted by determination of the ultra-violet absorption spectra of the contained oil by calculation from the absorbencies of the masterbatches, and comparison of these spectra with the spectra of a series of 10 oils of varying aromatic content.

It was concluded that the oil group, that is, aromatic, non-aromatic or naphthenic, may be identified in all cases, if the type of polymer is known, and the oil and stabilizer concentrations are known at least approximately. If the oil and stabilizer concentrations are known exactly, and an absorption curve is available for polymers of the same type, it is believed that in most cases these 10 oils can be identified individually.

VARIOUS investigations have been conducted at the Government Laboratories concerning the breakdown of the polymer in oil-polymer masterbatches. Information obtained has revealed the significance of the chemical properties of oils in relation to the stability of the masterbatches in which they make up the oil component. Because of the variety of oils that can be masterbatched with synthetic rubber polymers, there has been a recognized problem in finding suitable methods for identifying the oil that exists in an unrecognized oil-polymer masterbatch. In the course of the various investigations, ultra-violet absorption spectra were determined for a number of oils.[2] These oils comprised a series varying in aromatic content.

As ultra-violet absorption spectra have been used for the identification of petroleum products and their components,[3] it was believed that these spectra could be used for the identification of oils present in unknown masterbatches.

Such an identification was attempted with a series of masterbatches containing various oils and types of polymer, and the results are reported here.

Experimental Procedure

Thirty-nine samples, consisting of nine groups, each of which included an oil-free base polymer and several oil-polymer masterbatches prepared from the same latex, were submitted as unknowns to an analyst. The masterbatches were known by the analyst to contain approximately 37.5 parts (27.3%) of one of 10 oils for which ultra-violet absorption spectra had been determined. These spectra are shown in Figures 1, 2, and 3, and the composition of the masterbatch samples is shown in Table 1.

Solutions of the samples were prepared as shown in Table 2. n-Heptane was used when a clear solution could be obtained with this solvent. In cases where the sample was partially insoluble in n-heptane, 85% methylcyclohexane/15% absolute ethanol was used for the original solution, and the dilutions were made with n-heptane to obtain a final mixture which was satisfactory in optical characteristics.

The absorbencies of the solutions were determined in the range from 220 to 270 mμ, using a Beckman Model DU spectrophotometer. Absorbency was determined at 1-mμ intervals from 220 to 250, and at 2-mμ intervals from 250 to 270. Absorbency is the logarithm of the reciprocal of I/I_o, which is the ratio of the intensity of the light transmitted through the polymer and the intensity of the light before it penetrates the polymer.

$$A = \log_{10} I_o/I$$

The reference cell was filled with the same solvent, or mixture, which was used in the solution.

Example of Calculations

The absorbency indices of the base polymers were calculated, using the following equation:

$$\text{Absorbency index} = K_b = \frac{A_b}{C_b}$$

where:

A_b = Absorbency (optical density) of the base polymer.

C_b = Concentration of base polymer, grams/liter.

[1] The work described herein was conducted as part of the Government Synthetic Rubber Program by the National Science Foundation.

[2] RUBBER WORLD, Dec., 1955, p. 383.

[3] N. G. Adams, D. M. Richardson, *Anal. Chem.*, 23, 129 (1951). R. E. Hersh, *et al.*, *Ibid.*, 20, 434 (1948).

TABLE 1. COMPOSITION OF OIL-POLYMER MASTERBATCH SAMPLES.

Sample No.	Polymer Type and Description*	Polymerization Temp. °F.	Oil (37.5 Pts.)
87—Base	GR-S-1000	122	None
85			Sundex 53
86			Dutrex 20
88			Circosol-2XH
90			SPX-97
27—Base	GR-S-1502	41	None
17			Dutrex 20
28			Sundex 53
31			Circosol-2XH
32			SPX-97
62—Base	GR-S-1502	41	None
61			Circosol-2XH
63			Dutrex 20
64			Sundex 53
51—Base	GR-S-1503	41	None
48			Dutrex 20
49			Circosol-2XH
50			Sundex 53
52—Base	GR-S-1503	41	None
53			Dutrex 20
54			Circosol-2XH
55			Sundex 53
106—Base	72/28 BD/S	41	None
107			Dutrex 20
108	SFS Formula		Circosol-2XH
110	Mixed Soap Emulsifier		SPX-97
111			Sundex 53
118—Base	72/28 BD/S	41	None
119	SFS Formula		Circosol-2XH
120	Fatty Acid Soap		Dutrex 20
122	Emulsifier		Sundex 53
123			SPX-97
33—Base	Polybutadiene	0	None
35			Sundex 53
36			SPX-97
105—Base	Polybutadiene	0	None
102			Dutrex 20
103			Sundex 53
104			SPX-97

*All polymers were stabilized with PBNA.

The value A is obtained directly from the dial reading of the instrument. The apparatus was adjusted before each reading to cancel out the absorption of light due to the solvent, thus arbitrarily assigning 100% transmission to the intensity of the light transmitted through the solvent itself. Any decrease in transmission of light through a solution of polymer in the solvent would then be attributable to the polymer.

From these data the absorbency of the polymer present in the masterbatch was calculated. In all calculations the polymer content (including acetone extractables) was assumed to be 72.7%, and oil content 27.3%, of the weight of sample present in the final solution.

$$A_p = K_b C_p$$

where:

A_p = Absorbency of polymer in sample solution.

C_p = Concentration of polymer in sample solution, grams/liter.

The difference between the determined absorption of the masterbatch and the calculated polymer absorption was assumed to be the absorption of the oil present. The absorbency indices of the oils were therefore calculated:

$$K_o = \frac{A_m - A_p}{C_o} = \frac{A_o}{C_o}$$

where:

K_o = Absorbency index of the oil present in the masterbatch.

A_m = Absorbency of the masterbatch.

C_o = Concentration of oil in the masterbatch, grams/liter.

A_o = Absorbency of the oil in the masterbatch.

An example of the calculation is shown, using sample #90 at 260 mμ, with an original concentration of 0.03012-gram masterbatch/liter. The calculation is shown in steps for convenience.

1. Calculation of Composition of Sample Solution:

$$C_o = \frac{27.3\% \text{ x } 0.03012\text{-gm. masterbatch}}{\text{liter}} = \frac{0.008223\text{-gm. oil}}{\text{liter}}$$

$$C_p = 100\% - \frac{27.3\% \text{ x } 0.03012\text{-gm. masterbatch}}{\text{liter}} = \frac{0.02190\text{-gm. polymer}}{\text{liter}}$$

2. Calculation of Base Polymer Absorbency Index:

$$K_b = \frac{A_b}{C_b} = \frac{0.151}{0.1051} = 1.44$$

3. Calculation of Absorbency of Contained Polymer:

$$A_p = K_b C_p = 1.44 \text{ x } 0.02190 = 0.032$$

4. Calculation of Absorbency Index of Contained Oil:

$$K_o = \frac{A_m - A_p}{C_o} = \frac{0.280 - 0.032}{0.008223} = 30.2$$

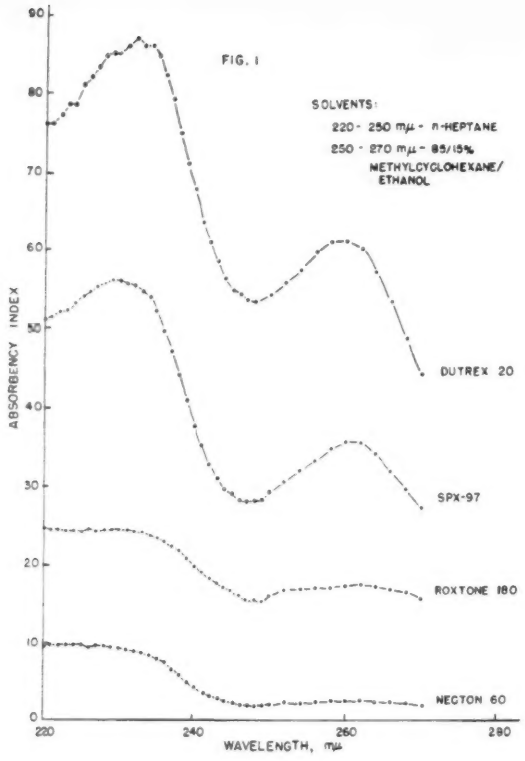
Example of Comparison Procedure

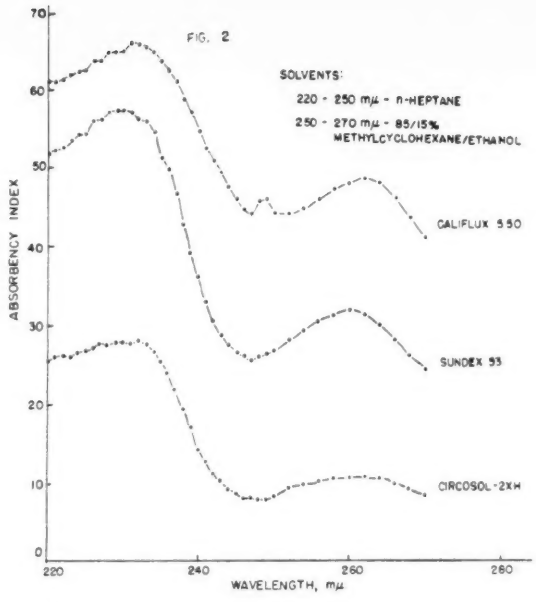
The absorbency indices thus calculated for the contained oils, and the previously determined absorbency indices of the 10 processing oils were then plotted *versus* wavelength. The procedure employed for the

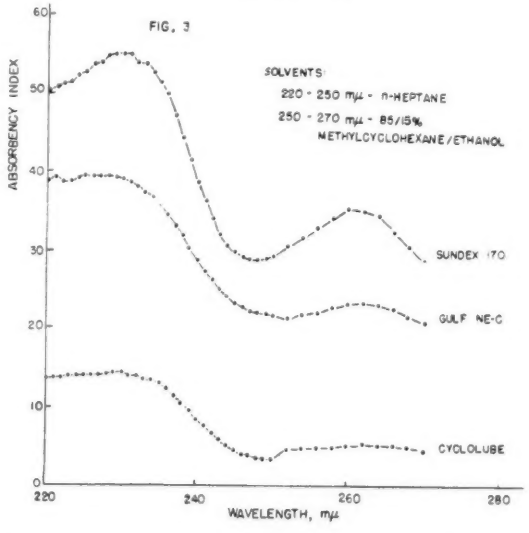
TABLE 2. SOLUTIONS OF MASTERBATCH SAMPLES USED FOR ANALYSIS

Sample Number	Original Solution: Weight Polymer gm.	Original Solution: Volume of Solution ml.	Original Solution: Solvent	First Dilution: Aliquot Diluted ml.	First Dilution: Volume of Dilution ml.	First Dilution: Solvent	Second Dilution: Aliquot Diluted ml.	Second Dilution: Volume of Dilution ml.	Second Dilution: Solvent	Final Solution: Concentration gm/liter: Oil	Final Solution: Concentration gm/liter: Polymer	Final Solution: Solvent
27 - Base	0.3006	100	a	10	100	n-	30	100	n-	0	0.09018	b
17,28,31,32	0.1003	"	"	"	"	Hep-	"	"	Hep-	0.008215	0.02188	"
						tane			tane			
33 - Base	0.1002	100	n-	10	100	n-	--	--	--	0	0.1002	n-
34	0.1003	"	Hep-	"	"	Hep-	"	"	n-	0.008215	0.02188	Hep-
35	0.0999	"	tane	"	"	tane	"	"	Hep-	0.008182	0.02179	tane
36	0.1001	"	"	"	"	"	"	"	tane	0.008199	0.02183	"
51 - Base	0.3003	100	a	10	100	n-	30	100	n-	0	0.09009	b
48,49,50	0.1003	"	"	"	"	Hep-	"	"	Hep-	0.008215	0.02188	"
						tane			tane			
52 - Base	0.3005	100	a	10	100	"	30	100	"	0	0.09015	b
53,54,55	0.1004	"	"	"	"	"	"	"	"	0.008223	0.02190	"
62 - Base	0.3002	100	a	10	100	"	30	100	"	0	0.09009	b
61,63,64	0.1004	"	"	"	"	"	"	"	"	0.008223	0.02190	"
87 - Base	0.3504	100	a	10	100	"	30	100	"	0	0.1051	b
85,86,88,90	0.1004	"	"	"	"	"	"	"	"	0.008223	0.02190	"
105 - Base	0.1001	"	n-	10	100	"	--	--	--	0	0.1001	n-
102	0.1002	"	Hep-	"	"	"	30	100	n-	0.008206	0.02185	Hep-
103	0.1000	"	tane	"	"	"	"	"	Hep-	0.008190	0.02181	tane
104	0.1003	"	"	"	"	"	"	"	tane	0.008215	0.02188	"
106 - Base	0.3007	100	a	10	100	"	30	100	"	0	0.09021	b
107,108, 110,111	0.1001	"	"	"	"	"	"	"	"	0.008198	0.02183	"
118 - Base	0.3002	100	a	10	100	"	30	100	"	0	0.09006	b
119,120, 122,123	0.1004	"	"	"	"	"	"	"	"	0.008223	0.02190	"

a 85% methylcyclohexane/15% absolute ethanol.
b 97.00% n-Heptane/2.55% Methylcyclohexane/0.045% Ethanol.







Figs. 1-3. Ultra-violet absorption spectra of 10 oils used in oil-polymer masterbatches

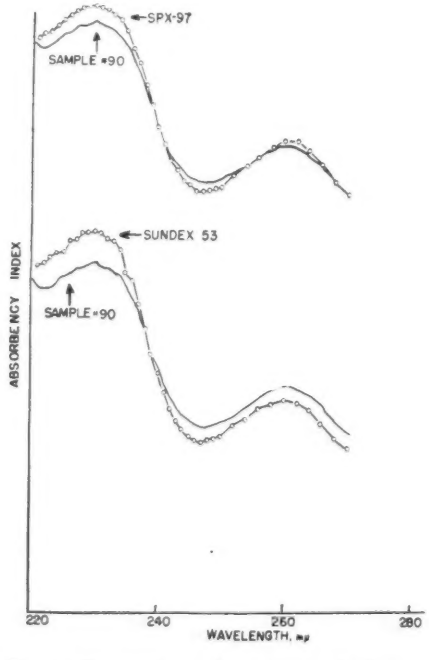


Fig. 4. Comparison of spectrum of oil contained in masterbatch sample #90 with spectra of SPX-97 and Sundex 53 oils

identification of the oil contained in each sample will be discussed in detail for a single sample, #90.

The magnitude of absorbency index of the oil contained in the sample was considered first. Because of the uncertainty of the concentration value, this factor was regarded as accurate only to ±10 absorbency index units. As sample #90 has maxima near 49 and 30, with a minimum near 22, Necton 60[4] (Figure 1), Cyclolube[5] (Figure 3), Circosol-2XH[6] (Figure 2), and Roxtone 180[4]

[4] Esso Standard Oil Co., New York, N. Y.
[5] Golden Bear Oil Co., Oildale, Calif.
[6] Sun Oil Co., Philadelphia, Pa.

(See facing page)

Figs. 5-8. Ultra-violet absorption spectra of oils contained in oil-polymer masterbatches. Fig. 5 is Dutrex 20; Fig. 6, SPX-97; Fig. 7, Sundex 53; Fig. 8, Circosol-2XH. Numbers on extreme right are masterbatch sample numbers

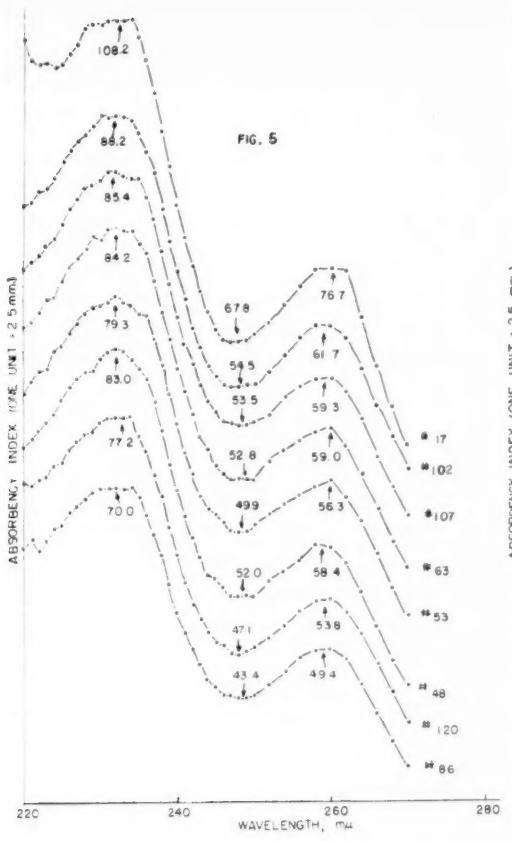


FIG. 5
ABSORBENCY INDEX (ONE UNIT = 2.5 mm)
WAVELENGTH, mμ
220
240
260
280
108.2
88.2
85.4
84.2
79.3
83.0
77.2
70.0
67.8
54.5
53.5
52.8
49.9
52.0
47.1
43.4
76.7
61.7
59.3
59.0
56.3
58.4
53.8
49.4
#17
#102
#107
#63
#53
#48
#120
#86

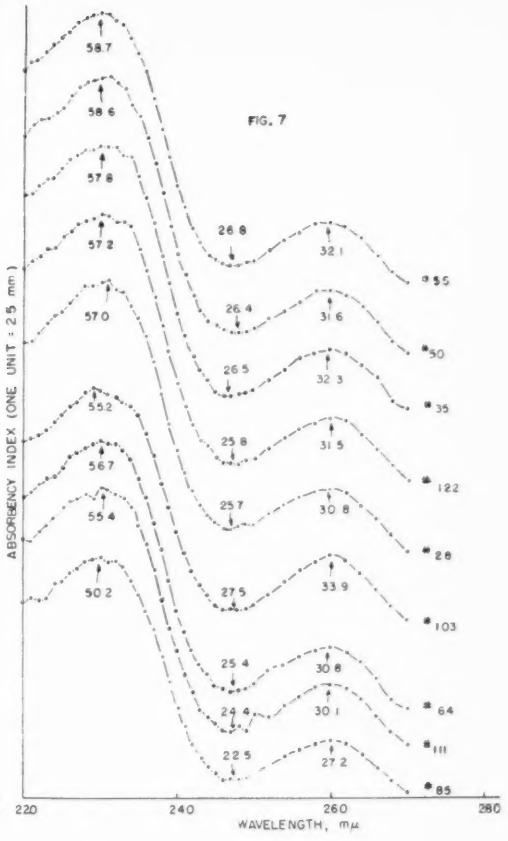


FIG. 7
ABSORBENCY INDEX (ONE UNIT = 2.5 mm)
WAVELENGTH, mμ
220
240
260
280
58.7
58.6
57.8
57.2
57.0
55.2
56.7
55.4
50.2
26.8
26.4
26.5
25.8
25.7
27.5
25.4
24.4
22.5
32.1
31.6
32.3
31.5
30.8
33.9
30.8
30.1
27.2
#55
#50
#35
#122
#28
#103
#64
#111
#85

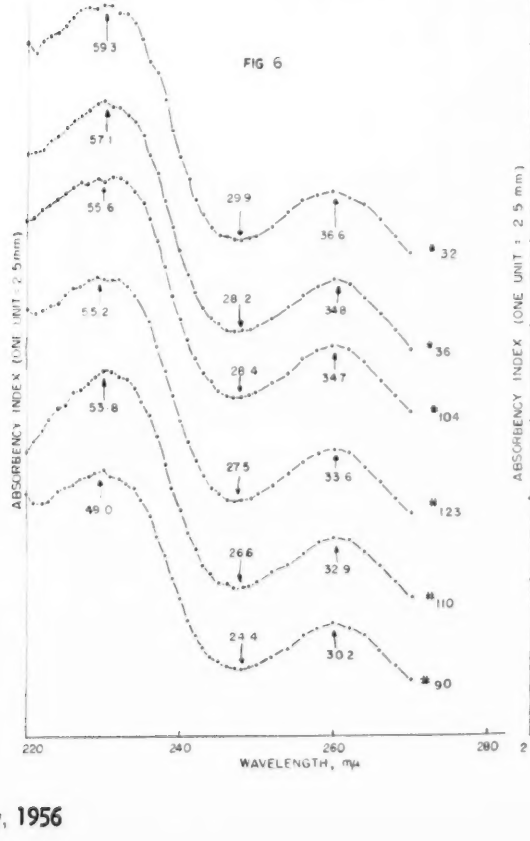


FIG 6
ABSORBENCY INDEX (ONE UNIT = 2.5 mm)
WAVELENGTH, mμ
220
240
260
280
59.3
57.1
55.6
55.2
53.8
49.0
29.9
28.2
28.4
27.5
26.6
24.4
36.6
34.8
34.7
33.6
32.9
30.2
#32
#36
#104
#123
#110
#90

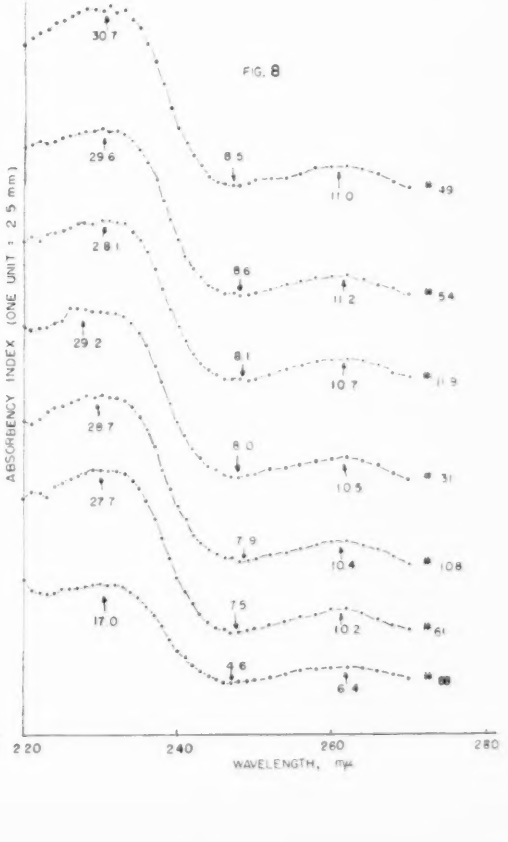


FIG. 8
ABSORBENCY INDEX (ONE UNIT = 2.5 mm)
WAVELENGTH, mμ
220
240
260
280
30.7
29.6
28.1
29.2
28.7
27.7
17.0
8.5
8.6
8.1
8.0
7.9
7.5
4.6
11.0
11.2
10.7
10.5
10.4
10.2
6.4
#49
#54
#119
#31
#108
#61
#66

(Figure 1), none of which reach 30 at the highest point, as well as Califlux 550[5] (Figure 2), and Dutrex 20[7] (Figure 1) which do not reach 40 at the lowest point, can immediately be eliminated from consideration.

While the curve for Gulf NE-C[8] (Figure 3) is approximately the right order of magnitude, even a rough comparison of the shape of the curve from sample #90 (Figure 4) with that of Gulf NE-C shows that both maxima are much less well defined in the Gulf curve. The peaks on the Gulf NE-C curve are broader; the highest points of the maxima occur at 228 and 262 mμ, and the lowest point of the minimum at 252 mμ. The drop in absorbency index from 228 mμ to 220 mμ is negligible. The sharper peaks of the curve determined for the oil contained in sample #90 have their highest points at 230 and 260 mμ, while the lowest point of the minimum is at 248 mμ. There is a noticeable drop in absorbency index from 230 to 220 mμ. For these reasons it was decided that sample #90 did not contain Gulf NE-C.

The three remaining possibilities were Sundex 53, Sundex 170, and SPX-97. A comparison of the spectra of Sundex 170 and SPX-97 shows that the curves are so similar that when allowance is made for the slightest error in calculation of the spectra of the oils contained in the samples, these two oils are indistinguishable. Therefore one of these two curves was selected at random, and comparison was made on the basis that samples having spectra corresponding to that curve could contain either Sundex 170 or SPX-97. As the curves were on separate sheets of transparent paper, the spectrum for sample #90 was superimposed as nearly as possible on the spectrum for Sundex 53 and SPX-97, disregarding the magnitude of the absorbency indices.

Figure 4 shows that while there is quite good agreement between the spectra for SPX-97 and the oil contained in sample #90, that for Sundex 53 is quite different. The most striking difference is that although the maximum near 230 mμ is higher for Sundex 53 than for sample #90, the minimum, and the maximum near 260 mμ are lower; that is, the height of the peaks relative to each other and to the minimum differs considerably. Sundex 53 was therefore eliminated, and it was concluded that sample #90 contained either Sundex 170 or SPX-97.

Results and Discussion

By a comparison of absorption curves, similar to that described for sample #90, identification of the unknown masterbatches was attempted. In all cases in which the contained oil was either Dutrex 20 or Circosol-2XH, the identification was correct, because of the wide difference in absorbency values of these two oils. For the reasons previously discussed, no attempt was made to distinguish between Sundex 170 and SPX-97; however, in all cases in which the contained oil was of the SPX-97 type, the sample was considered by the analyst to contain either SPX-97 or Sundex 170 since their spectra are almost identical.

Of the nine samples containing Sundex 53, seven were correctly identified, but two, #85 and #103, were again considered to contain SPX-97 of Sundex 170 for the reasons mentioned above.

After identification, the original curves, grouped according to oil, were traced on to a single graph; for ease of comparison, the curves were displaced on the y axis (Figures 5, 6, 7, and 8). Actual values of the maximum and minimum points are indicated for each curve by the arrows.

Although identification was made from among all 10 oils, masterbatches containing only four different oils individually were submitted for analysis. This was done because with these four oils, masterbatches representative of a wide variety of base latices were readily available.

Although the shapes of the spectra are in most cases readily recognizable, they are displaced vertically from the oil spectra in some cases. As the concentration of oil was assumed to be precisely 27.3% of the masterbatch concentration, and an error of 2% in this assumption could cause an error of as much as 6.5 units in absorbency index, variations in concentration probably account for this displacement. Because absorbency is a logarithmic function, some change in the shape of the curve also occurs when calculations for absorbency indices are made on the basis of erroneous concentration of values.

The absorption spectra of SPX-97 and Sundex 53 are of approximately the same magnitude, and the chief difference between them is the difference in the relative height of the peaks at 230 and 260 mμ. If the concentrations are erroneous in samples #85 and #103, this may account for what may be the two erroneous identifications.

The curve for sample #17, while it is obviously a Dutrex 20 curve, seems to be displaced to a greater degree than can be accounted for by concentration.

Many of the commonly used synthetic rubber antioxidants are substances which absorb ultra-violet light in the region where the distinguishing characteristics of the oils discussed here occur, and it has also been shown that other components of polymerization formulae affect the ultra-violet absorption characteristics of synthetic rubber to varying degrees.[9] It is evident, therefore, that not only is the concentration of oil a variable to be considered, but also the nature of the base polymer.

Conclusions

On the basis of the data reported here, it may be concluded that, when absorption curves for similar polymers are available, and oil and antioxidant concentrations are known even approximately, the oil present can be identified by group, that is, highly aromatic, nonaromatic, or naphthenic.[10] If the concentrations of oil and antioxidant are known precisely, the 10 oils discussed here can very probably be identified, with the exception of SPX-97 and Sundex 170, which cannot be differentiated from each other.

[7] Shell Oil Co., New York.
[8] Gulf Oil Co., Pittsburgh, Pa.
[9] D. C. Prem, J. T. Duke, T. B. Larchar, Sr., "Optical Density Data Relating to Background Corrections for Stabilizer Analyses." University of Akron Government Laboratories, AU-1244, SP-T-547 (Aug. 24, 1954).
[10] Former Office of Synthetic Rubber, Federal Facilities Corp., Specification Methods.

EDITORIAL

Is the Rubber Industry Spending Enough on Research?

THE National Science Foundation recently released a preliminary report of a survey of industrial research and development costs and personnel in American industry for 1953, in which expenditures by the rubber products industry seem to lag behind those for other industries. The survey was conducted by the Bureau of Labor Statistics for the NSF to provide information for developing and recommending policies to strengthen our scientific research effort.

The preliminary report is entitled, "Science and Engineering in American Industry," and is obtainable from the U. S. Government Printing Office, Washington, D. C. The survey was made by sending questionnaires to approximately 11,600 companies, carefully chosen to be representative of the several branches of American industry. The preliminary report emphasizes certain findings, but unfortunately ignores or does not provide sufficient information about others.

It was found, for example, that private industry spent $3.7 billion in 1953 on research and development (RD) activities, a much higher figure than the less than $2 billion reported for 1951 in an earlier BLS survey. Total expenditure for RD activities in 1953 by private industry, government, educational institutions, etc., exceeded $5 billion. About one-third of the $3.7 billion spent by private industry, however, was for RD work done for the Federal Government.

What the report did not emphasize was that only one-half of the total $5 billion RD cost was a private-industry expenditure.

Of the 18 industries surveyed, electrical equipment ($778.3 million) and aircraft and parts ($758.0 million), ranked first and second, respectively, in total RD dollars spent. The chemical industry ($361.1 million) ranked fourth, and the rubber products industry ($53.6 million) twelfth.

This information should have been accompanied by each industry's 1953 total dollar sales so that total RD efforts could have been compared on a more practical basis.

Industries were also ranked according to the amount spent on basic research, and here the chemical industry was far in front with a $37.8 million figure; electrical equipment was second with $18.7 million; and aircraft third with $18.1 million. The rubber products industry was thirteenth with only $3.1 million spent. The industries were also ranked on the basis of percentage of the total RD cost spent on basic research, and a different line-up, except for chemicals, resulted.

Here again the amount spent on basic research in terms of percentage of dollar sales would provide a more useful comparision.

It has been possible by using a total dollar sales figure for the rubber products industry reported by the Office of Business Economics, U. S. Department of Commerce, for the year 1953 of $5.017 billion to arrive at 1.07% for the total RD effort based on sales. The percentage figure for basic research on the same basis is only 0.06, however, for the rubber products industry.

In contrast, based on a 1953 dollar sales figure of $20 billion for the chemical industry, the percentage for total RD activities was 1.8, and for basic research, 0.19.

Does this mean that the rubber products industry is not spending enough on both total and basic research?

R. G. Seaman

EDITOR

Meetings and Reports

Akron Group's "Automation–Rubber Manufacturing" Symposium–II

Fabrication

By George P. Bosomworth
Firestone Tire & Rubber Co.

Automation means all things to all people. To some it means mechanization of individual machines; to others it means automatic handling of material from one machine to another by conveyors; to still others it means the use of programming devices for the complete automatic control of processes involving a sequence of many machines. In our industry people are already making some of the individual machines which will ultimately be part of the complete automation picture.

Automation will not be accomplished by individual efforts of the engineering staff, the compounders, equipment manufacturers, development or production departments. It will succeed only through the combined efforts of all, because modification of materials, processes, machine characteristics, and product design probably will be necessary.

Unlike those in the machine tool or radio industry, we who work in the rubber field are faced with the problem of handling materials which may not be completely stable in characteristics or dimensions. For instance, the possibility of change in bias angle of fabrics or tread length encountered in transferring these components from one place to another is well known. We who are concerned with machine design and automation would like to have the help of those in the fields of chemistry and textiles so that we may get materials which will stay put in processing.

Automation in Tire Stock Processing

The greatest progress in automation will be in those industries which control the individual components of the product to the highest degree during manufacture. For example, the accurate placement of a ply on a tire-building machine by some automatic device will be directly related to the control of ply width.

In the equipment itself the advance of automation will require close control of the machine components—speed, acceleration, tension, pressure, etc.

In the field of calendering, some strides have been made toward automation. Realization of the importance of close temperature control prompted the use of drilled rolls and water circulation systems. This development, of course, is necessary not only to overcome problems in processing, but also to attain dimensional stability of the rolls. One of the latest advances is in the use today of some form of beta-ray gage. This gage can automatically control the weight per square yard of calendered fabric. The use of this and similar types of control equipment will eventually make it possible to "fly" the calender on instruments. The operator, however, will probably still want to take a look at the process now and then.

Before we advance in automation in bias cutting of fabric, we require increased accuracy at higher speeds with automatic handling of plies for band building or single-ply methods.

In tread tubing we need tubers that will not produce a cyclic variable in the dimensions and the weight of the tread section. Control of the amount of feed stock delivered per minute would be an advantage in stabilizing the process. Here again we have examples of how a component of a process requires improvement before we really get started on automation.

There must be as many different conveyor systems used in handling tread tubing as there are users. Automatic control of a tuber installation requires close control of conveyors if uniformity of treads is to be maintained.

There must be any given number of methods used to preset the tread cutter for length; yet accuracy with flexibility in presetting continues to be a problem. This situation is further complicated by post-tubing shrinkage due to thermal and mechanical reorientation of the extruded tread. The shrinkage of tread stock is probably one of the most difficult problems to solve in connection with the automation of tread tuber installations. If the chemists could give us a "dead" compound which would still meet their requirements, they would help us appreciably with this shrinkage problem.

Tire Building

All of the components that make up a tire must be brought to the tire building machine with the expectation that they have been produced with uniform dimensions and characteristics. If this is not the case, then we immediately limit the degree of automation possible. The operator will then have to exercise his discretion and interrupt the automatic programming of the machine in order to take care of the deviation characteristics of these tire components.

If we look back a few years to the period when a tire machine was simply a drum, shaft, and a motor with hand stitchers, we would realize just how far the industry has progressed in this field.

During the last five years much attention has been paid by the machinery manufacturers to the development of automatic tire building machines. The automation of passenger-tire-building machines has reached a high degree of development. It was, of course, the right place to start because of the high volume of production involved and the knowledge that there were fewer problems to solve with single-bead tires. With these machines the various operations can be done automatically on a completely timed program basis. Alternatively, the separate operations can be performed in group sequences. The latter procedure appears to be preferred at this time.

Using the group sequence method, it is possible to provide more flexibility of operation to take care of such things as six-ply construction, the addition of gum strips, the addition of cap plies, etc., at the appropriate times in the cycle.

These automatic tire-building machines are getting more complex, however, and the maintenance work involved is increasing. Down time for drum changes is becoming more significant. Any improvements that can be developed to reduce this lost time will be advantageous.

The tubeless tire has drawn attention to the need of improved drums, with particular reference to the smoothness of the drum in contact with the inner liner. Recently made available was a new six-section drum which is collapsed in two groups of three sections through the use of an air cylinder on the end of the drum shaft. The drum can be collapsed with the assembly at rest. This feature should reduce maintenance on the drum.

The automation of heavy-duty machines has been given further impetus by the introduction of the tubeless single-bead truck tire. In this case there has been an extension of the methods used in the passenger-tire-model machines.

With heavy-duty machines, however, we are dealing with a greater variety of tire constructions and wider plies with longer turn-ups. In some cases ply rings are used. Heavier breakover tools and larger stitchers are necessary to take care of the increased number of plies which must be handled at one time.

As in the passenger-tire field, a series of group sequences is indicated as the basis for the control of these machines, rather than a complete programming procedure. For example, the group sequence of the ply breakover, bead set, and ply turn-up would be initiated by the operator.

Automatic machines for twin-bead tires present a different problem. These machines must be able to handle contour drums, multiple-ply turn-ups, stitcher positioning for two beads; while for single-ply, rings are required.

I have no doubt that the equipment manufacturers and industry engineers are working on some form of automation for HD twin-bead tire machines. It is a difficult assignment in view of the range of tire sizes and constructions which must be handled.

To permit programming of these machines, it will be necessary to have special stitcher mechanisms. They must have at least three degrees of freedom—rotational, transverse, and longitudinal—to take care of the contour drum and the different positions of the first and second beads. Probably more flexibility will be required in presetting drum heights; more gradual contours in bead area and the use of simple bead tie-ins would reduce some of the problems. Advanced mechanization rather than complete automation for twin-bead machines appears a near-term prospect.

Probably the next major advance in automation of tire building will occur when we completely integrate the stock let-off or band-ply handling equipment with the tire machine. We would like to have, in such a combination, a device which would automatically find the right ply and place it on the drum in the correct position. The same would apply for the tread and other components.

Better Maintenance Required

As we advance further into automation, it will become increasingly necessary to expand the skills of the mechanical personnel to take care of the complex equipment. To keep this expensive equipment as free from down time as possible, this personnel will have to know not only the elements of the machine, but also the process requirements.

Solutions to the problems of automation in our industry will be found through the cooperation of the technical, production, and engineering staffs together with the help of the equipment manufacturers.

Tire Curing

By Joseph Torrey

The Goodyear Tire & Rubber Co.

Man's first experience with the vulcanization of rubber was a completely automatic operation.

When Charles Goodyear slopped a mixture of rubber and sulfur on a hot stove, he didn't even have to push a button; the cure was completed without further human assistance.

The earliest vulcanized rubber products were cured generally by a process which represented very little departure from Charles Goodyear's original accident. Forms, or materials, were coated with mixtures of rubber and sulfur and were heated, generally by being hung or laid over bars or racks in some sort of heated enclosure or vessel. At this stage, however, the products involved were simple; the rate of vulcanization was slow, and the chemical combination between rubber and sulfur so incomplete that considerable variations in time and temperature were matters of small consequence.

The big impetus toward automation was sparked by the demand for tires for bicycles, and later for automobiles, which quickly became mass-production items, and, because of the constantly expanding tire service requirements, brought out the need of an adequate control over the vulcanizing process.

Since the presses at that time were generally clumsy machines and many of them screw operated, the turnover was necessarily low, and the industry turned to building up a stack of molds in a closed vessel, or pot heater. The pot heater was provided with a hydraulically operated ram, by means of which the stack of molds was jammed up against the lid and held there with sufficient pressure to keep the molds fully closed during the cure.

There was nothing very automatic about this pot heater process in its early stages, as the heat control was effected by regulating steam pressure (rather than temperature) by manipulating inlet and outlet valves.

About 1920 when accelerators of vulcanization came into general use, the process started to change; cures became much shorter and therefore much more critical, while, at the same time, tire service requirements, because of the rapid development of automobiles, became much more rigorous.

During the Twenties, primarily for the sake of economy in building, the industry had developed the process of building tires in more or less of a cylindrical form in order to eliminate the tedious and difficult process of "stitching" plies to conform to natural-shaped core. This development, of course, necessitated the introduction of a "shaping" operation either prior to, or simultaneously with, insertion of airbag.

Shaping machines were produced in several forms. One consisted of a series of radial arms, each furnished with a series of overlapping plates, which could be extended to stretch the tire to something approximating its final shape, and retracted to permit its removal.

Another method was to collapse the airbag mechanically, into the form of a clover leaf, slip the flat-built green tire over it, and place the assembly into a centrifuge in which it was spun until sufficient force had developed to extend the tire to its natural shape and permit the airbag to adjust itself evenly to the inside of the casing.

Bicycle Equipment Curing

Our purpose in this talk is to follow the process of vulcanizing tires through its successive stages since that time and to describe each one briefly.

The earliest bicycle tires were made in the form of a tube, produced by rolling successive layers of rubberized fabric, and a rubber cover, on to a mandrel, stripping off the assembly, valving and splicing it, and curing it in a mold with air, under pressure, while furnishing inside support for the tire.

Later the "wired-on" type (the forerunner of the straight side tire) and the beaded edge or clincher designs were produced in Europe, by building in the form of a flat band, preshaping to a certain extent, and curing in a mold with an inflatable tube or airbag to provide the necessary inside pressure.

At this stage, vulcanization was generally carried out in a single-daylight platen press, of the type which had been designed originally for the production of molded goods.

An alternative method consisted of engraving a tread pattern into the surface of a flat cylindrical drum, fabricating the tire on the drum, wrapping it with fabric, and vulcanizing it in an autoclave. In this latter case, of course, the tire had to be turned right side out after it had been cured. Relatively little machinery was used in tire manufacture at this time, and none of it could be described as automatic, in any sense.

Auto Tire Equipment

When the automobile tire came along, it naturally started out as a magnified version of the bicycle tire and was produced in much the same way, either as a single tube, or in the clincher or beaded edge form.

The single-tube type soon passed out of the picture, and the earliest large-scale production, first of the beaded-edge type, and later of the straight-side type, was fabricated on solid metal cores out of square-woven fabric.

Until the early Thirties, however, the standard process of curing still followed the use of the ram-loaded pot heater previously described, but with considerable progress in the direction of providing heat from within, by the use of steam or hot water in the pressure bag, and in the provision of automatic equipment for controlling the heat flow, and regulating it on the basis of temperature rather than steam pressure.

At this stage of development most of the automation took the form of steam-pressure control valves, but progress in the direction of mechanical refinements was slow.

Prior to this period, molds had been made with the mold ring, or portion which molds the bead area separate, and these mold rings were applied to the tire with the airbag in place, before the assembly was laid in the mold.

Again in the early Thirties, two important moves were made: namely, (1) the provision of means for assisting the operator in inserting the airbag, which had previously been manually inserted into the tire; and (2) the development of a process for incorporating the mold rings into the mold, in order that the tire and its pressure bag might be laid in the mold without the necessity of the preliminary operation of applying the bead rings.

The machines at this stage might be described as semi-automatic as they were generally electrically operated and carried out the major part of the operation with relatively little assistance from the operator.

Automatic Vulcanizers

The first really automatic vulcanizing equipment was the watch-case vulcanizer which was first used in 1938. This machine

was built to open and close along the lines of a clamshell, and the two halves of the mold were securely fastened to the upper and lower platens, or shells.

These machines, from the outset, were furnished with timers of one kind or another which automatically closed the press, actuated the inlet and exhaust of steam to the internal pressure bag, maintained the temperature in the platens at the desired level, opened the press at the end of the cure, and stripped the tire from both halves of the mold.

The operation of inserting the airbag was still a laborious and time-consuming one, however, and its elimination was studied by the industry from two different angles. One was the development of a vacuum-shaper into which the green tire was placed and drawn into more or less of a toroidal shape, by the application of vacuum to its outer surface. In this form it was much easier to insert the airbag, and, for use with the larger sizes, a power-operated ram, generally known as an "elephant's foot," was provided, by means of which the operator forced folds of the airbag down into the tire cavity.

A second approach consisted of a much more automatic machine which consisted of a well into which the pressure bag was drawn by means of an automatic, power-operated hook, and two platens—a lower one surrounding the upper end of the well, and an upper operated by a piston and cylinder from above. In this case, after the airbag had been drawn down into the well, the tire was set over the well opening, and the upper bead sealed by bringing the upper platen down into contact with it.

Air was admitted at this stage, and the upper platen continued to move downward as the pressure shaped the tire, and at the same time the airbag was forced up out of the well and into the semi-shaped, and finally fully shaped, casing.

The curing process by this time had become pretty much automatic. Essentially, all the operators had to do was to feed the tires and airbags into bagger and lay the bagged tire in the mold, but the procedure still consisted of two separate operations. To combine these into one operation, improved automatic presses were developed, first, in 1946, by McNeil Engineering Co., and later in other forms by National Rubber Machinery Co., and others.

These presses are designed to take the tire just as it comes from the building machine, with no operation intervening except that of applying the necessary anti-adhesives to the outer and inner surfaces of the green tire. A pressure diaphragm or "bladder" is provided as an integral part of the press mechanism. All that the operator has to do is to position the tire on the lower mold ring and push the button. At this point the press takes over; the bladder is brought to the proper position for shaping, and steam or air is admitted to the extent necessary to shape the tire progressively as the press closes.

When the press is fully closed, a cycle timer admits steam to the inside of the bladder or air bag at the curing pressure, reduces it later at the stage when the tire has been fully formed, switches over to water under pressure, at the point where the carcass cure is complete, accurately maintains temperature on the platens or in the domes of the machine, and opens the press when the curing cycle has been completed.

When the press opens, the bladder withdraws; the tire is automatically stripped from both halves of the mold and in some cases is automatically ejected on to a take-away conveyor.

The introduction of the tubeless tire has presented the possibility of going a step further with this process.

Vulcanizers for Tubeless Tires

Tubeless tires, being furnished with a lining of rubber compound, are capable of acting as their own containers for the air, or steam, used in shaping and curing. Processes are now being developed with the aim of eliminating the bladder which has been used in the automatic presses and providing in its place rings which mechanically seal the tire cavity at the beads, thus permitting the internal pressure medium to be admitted directly to the tire cavity.

These presses as yet are in the semi-experimental stage and their success will depend primarily on the ability to develop a means of eliminating all possibility of a leak through the tire liner, particularly at the points where splices occur.

Admittedly, the inside appearance of tires cured in this way leaves something to be desired, as there is no provision for ironing out and smoothing down splices, but the inside appearance of such tires is a relatively small factor and is something which the public probably could be induced to accept, without too much opposition.

However, in an effort to eliminate the possibility of any such adverse reaction, another process is being considered whereby the bladder is still employed, but is used only to carry out the preliminary shaping of the tire and is withdrawn very soon after the cure has started. By this means, of course, a certain amount of ironing is provided, and the bladder is not subjected to a succession of cures, which fact should have the effect of increasing its life enormously.

So it seems that we have pretty nearly completed a cycle, in this process of vulcanization.

Charles Goodyear's original experiment required no further attention from him once he had dumped his gum on the stove, and the latest types of press require nothing more than to drop in a tire and press a button.

What further developments the engineers can find to occupy themselves from here on in is a matter for conjecture, but for our part this is where we came in.

Mechanical Goods

By John Brothers

Ohio Rubber Co.

In view of the fact that mechanical goods manufacturers were singled out as a special subject on this panel discussion, it must be assumed that we are a special group of individuals in the rubber industry. To a limited extent this is true. Possibly we do process and have in our files a greater number of active recipes which in turn will tend to reflect the need of automatic handling or automatic processing, since in a mechanical goods plant we have a greater variety of mixed compounds and a smaller number of individual batches to be mixed at any one given scheduled time.

One of the earlier speakers has covered in his talk, material preparation including automatic compounding, mixing, and pelletizing. Since the equipment for this purpose has recently been installed at our plant, we feel that it is desirable to detail some of the problems involved.

Automatic Handling of Compounding Ingredients

In order to have this type of automatic handling, the various vendors were first contacted so that they in turn could do some preliminary work relative to handling their compounding ingredients with automatic equipment. At the time that this automatic mill room development was initiated for our company, it was possible to receive in bulk certain high-volume loading pigments. In general these would include liquid softeners and carbon blacks. It was known that some other manufacturers were handling clays and whitings in bulk, but it was generally assumed that only those hard carbon blacks produced in pelleted form could be bulk handled. Considerable development work and equipment modifications were made in order to enable us to receive and bulk handle the softer carbon blacks that were not pelletized, particularly the thermal decomposition type.

At the same time work was initiated by our reclaim suppliers to enable them to ship pelletized reclaimed rubber in bulk. This development required special processing techniques and special machinery which our suppliers had to purchase and install in their plants. Prior to this time we had thought that reclaimed rubber should be aged between three and five weeks in order to minimize processing variables. With the advent of reclaimed rubber pellets, this thinking had to be modified since adequate storage space was not available to age them. Various test methods were revised relative to control of quality of fresh pelletized reclaim.

Modifications had to be made in the truck trailers used for transportation in order to insure cleanliness and to simplify unloading of reclaimed rubber pellets at our plant. Recently bulk shipments of reclaimed rubber pellets have been worked out for railroad cars. The transportation and use of pelletized reclaim require rigid control of scheduling with plenty of cooperation from the suppliers. With the suppliers in a position to ship pelletized reclaim, we then had to be ready to receive, handle, and circulate through our plant this raw material in order to minimize our manual handling. This has been done successfully.

At the start we were selective and attempted to process only high-volume stocks in order to achieve the maximum savings

possible due to the automation. During the initial planning stage it was recognized that special emphasis was being placed by our customers on various types of non-staining compounds. Arrangements were made during this initial engineering stage to provide for special duplicating injection and holding equipment for segregation of staining oils or pigments from the non-staining types.

It was soon determined that additional steps had to be taken in order to minimize variations in the weighing of low-volume use materials where minimizing the weighing error was of very great importance. These materials include zinc oxide, accelerator, antioxidant, sulfur, and various activators. Owing to the wide range of grades and types of these materials used, it was found that sufficient bin capacity was not available to automatically weigh each and every type of ingredient into the various types of batches that were scheduled. Consequently various types of ingredient blends were developed that could be used universally.

A 20-cubic foot blender was installed, and blends of various critical ingredients have been made and are being used. In general, this particular phase of the operation has been solved, and we are well satisfied with the progress.

We will not bore the group with a repetition of earlier remarks made about other aspects of operation of the automatic mill room and feel that the above discussion should be sufficient, except to outline some of the biggest problems of automatic compounding. These are: (1) material handling of a wide range of powders of varying particle size; (2) Hydroscopic tendencies of many pigments; (3) contamination.

Calender Gage Control

Over the past several years automatic equipment has been installed for the control of continuous calendered sheets. Various types of automatic gages can be used to control the thickness of this continouus operation. The beta-ray gage is one of these. This particular type of equipment will chart the actual calendering operation and the operator's ability to maintain the gage of the stock to a positve target with minimum variation and has exhibited an ability to provide for optimum saving in processing costs.

Automatic equipment has been developed that can be applied to many additional phases of the calendering operation. Continuous sheets from the calender can be treated with various pigments in order to minimize cohesion or to improve adhesion of the calendered sheets for future operations.

Other Advances

Many modifications have grown with the industry over the last few years, particularly within the molded goods area of mechanical goods production. We will pass over these with just a few remarks, in view of the fact that they are accepted as standard within the industry at this time. These features are transfer and injection molding. Various improvements have also been made by the machinery equipment manufacturers in conjunction with the mechanical goods manufacturers which have led to development of equipment that either automatically prepares uncured formed rubber for curing or will automatically index cured parts for final trimming and inspection.

In regard to the former, equipment can be used that will automatically cut continuously tubed stock into controlled volume blands. To carry this one step further, it is also possible to control stock volumetrically as it is delivered from the tuber and at the same time preshape into preforms that will approximate the mold curing cavity in size and shape.

Many improvements in molding equipment have been made that will enable the operator to get closer to his equipment and allow a greater degree of automation relative to loading or unloading the cured parts.

When the appearance of the finished part is not of prime importance or when the rubber part itself is solely a functional production part and is not used for its general appearance, many changes can be made relative to deflashing the cured parts. Included here are the various types of tumbling equipment that have been developed using dry ice and modifications using liquid carbon dioxide.

In the insulated wire industry it has long been practice to compound so that at the speed of cover addition to the wire, the wire insulation can be cured and rolled up on itself immediately. Recent innovations in the mechanical goods industry have allowed this industry to move into this CV-type stock acceleration to a far greater extent than was formerly thought possible, and it is now possible to compound and extrude, convey through continuous curing ovens, cut to size, and box, all in one continuous and complete operation.

(To be concluded)

Fourth Signal Corps Wire & Cable Symposium Sets Record For Attendance

The fourth annual Wire & Cable Symposium was held at the Berkeley-Carteret Hotel, Asbury Park, N. J., December 6-8, with 703 representatives of 243 industrial firms in attendance, both record figures.

The event, sponsored by the Signal Corps Engineering Laboratories, telecommunications division, Fort Monmouth, N. J., had for its topic, "Technical Progress in Communication Wires and Cables." Twenty-two technical papers were presented by experts from the Signal Corps and industry; the latter included representatives of English and Swiss firms.

Guest Speaker; Exhibition Program

H. L. Kitts, Signal Corps Engineering Laboratories, was chairman of the event and head of the committee in charge of arrangements. H. F. X. Kingsley, SCEL, was co-chairman. Others on the committee were: R. Blain, Signal Corps Plant Engineering Agency; E. J. Burrough, E. I. du Pont de Nemours & Co., Inc.; P. H. Grogan, General Cable Corp.; B. Jore, Anaconda Wire & Cable Co.; E. L. Love, Whitney Blake Co.; and C. T. Wyman, Bell Telephone Laboratories.

Brig. Gen. Earl F. Cook, Commanding General of the SCEL, gave the welcoming address. Maj. Gen. James D. O'Connell, Chief Signal Officer, was the principal guest speaker at the December 7 banquet.

A Signal Corps wire and cable exhibit on the Berkeley-Carteret mezzanine was open during the three-day activities.

Chairmen of the various technical sessions, in addition to Mr. Kitts, all associated with the SCEL, were: M. Tenzer, chief, microwave transmission lines unit; W. R. Krueger, chief, line facilities section; H. F. X. Kingsley, chief, field wire and cable section; and H. G. Gold, chief, special cable section.

A panel discussion on "A User's View of Plastic-Insulated Conductors in Outside Telephone Plant," on December 7, was conducted by engineers of Michigan Bell Telephone Co., including R. Foulkrod, W. M. Alexander, L. M. Dahl, and J. R. Kershaw.

Abstracts of Papers

A wide range of topics of interest to the rubber and plastics industries was covered by the invited speakers. Summaries of the 22 talks follow.

"Ultra-Accelerators in CV Vulcanization." L. A. Brooks, J. L. Tronson, A. C. Rowley, R. T. Vanderbilt Co.

Research over the past 25 years on the types and amounts of accelerators for the continuous vulcanization of rubber wire insulations was described as a prelude to the main discussion of current theories and practices concerning these materials. With the high-temperature curing systems now being used, it was urged that care be exercised in selecting those accelerators most adaptable to the process.

Bismuth dimethyl dithiocarbamate and lead dimethyl dithiocarbamate were said to be of particular interest by virtue of their desirable temperature coefficients of vulcanization as measured from various stocks. It is apparent that these accelerators are inactive until the higher continuous vulcanization temperatures are reached, at which time they appear to function as stable compounds rather than dissociating into a complex system of free radicals.

It was pointed out that for the realistic evaluation of accelerators in CV compounds, equipment is required which will cure the stocks in open steam and at temperatures corresponding closely to those employed in the production equipment.

"Physical, Chemical, and Electrical Properties of Marlex Ethylene Polymers." R. V. Jones, P. J. Boeke, W. R. Clark, Phillips Chemical Co.

Marlex 50, the first of a commercial

series of Phillips ethylene polymers based upon the polymerization of ethylene at low pressure, was discussed by the authors from the point of view of what were called striking improvements in the basic nature of ethylene polymers. The new Phillips process was said to be capable of producing thermoplastic resins having properties that range from soft, flexible polymers to the tough, high-modulus Marlex 50.

Physical properties of high-pressure polyethylene, irradiated high-pressure polyethylene, Marlex 50, irradiated Marlex 50, and Marlex copolymer were compared, showing that the Marlex 50's, particularly the irradiated product, possess distinct advantages of benefit to the wire and cable industry. Such properties as overall toughness, abrasion resistance, tensile strength, light weight, heat resistance, and low-temperature flexibility were found to be superior. Resistance to chemicals and weathering were also shown to be better.

Summarizing their findings, the authors stated that for utilization as wire and cable insulation, Marlex ethylene polymers offer all the advantages of conventional polyethylenes and, in addition, have extended the useful range of these thermoplastics by the following: increased softening temperature, improved abrasion resistance, extended environmental stress cracking time, and decreased permeability to liquids and gases.

"Improved Polyvinyl Chloride Insulation for 105° C. Service." H. L. Wuerth and B. W. Hodges, The B. F. Goodrich Chemical Co.

Six years ago Goodrich's Geon 8630 became the first vinyl compound to receive approval for appliance wire applications at 105° C. Further developments along this line proved valuable to new radio, television, aircraft, and military applications, the authors said, and to these high-temperature properties were added low-temperature properties, increased abrasion resistance, good insulation resistance after humidity cycling, and improved heat aging properties. Geon 8800 was developed incorporating all of these valuable properties.

The authors presented extensive data showing Geon 8800's superiority in these respects over standard 105° C. polyvinyl chloride insulation. Comparisons of physical properties were made with data acquired in tests on wire insulation of various constructions, in accordance with U. L. 105° C., NAS-702 (105° C.), MIL-W-16878B, and MIL-W-5086 standards. Finally the extrusion conditions necessary for Geon 8800 were listed.

"Obtaining Mobilization Preparedness for Signal Corps Wire and Cable." A. G. Christiansen, Signal Corps Supply Agency.

The most important factor of mobilization readiness for a long war was said to be the striking of an optimum balance between a reserve end-item stock and an industrial production mobilization base. On the basis of this assertion, the author believes that the position of field wire in case of an all-out war is not a happy one.

To rectify this situation is was urged that the necessary government-owned production equipment be stored at or near the actual plant where it would be used in the event of total mobilization, since it was not now economically feasible for the government to set up its own manufacturing lines. Statistics justifying these theoretical considerations were given.

The Signal Corps is in the process of expanding manufacturing know-how and acquiring and storing away long lead time items of wire manufacturing equipment. It is also looking for less critical replacements for such materials as tin and nylon now being used.

"Progress in Air Dielectric Cables." E. J. Merrell, A. Laird McKean, John Arbuthnott, Jr., Habirshaw Cable & Wire Division, Phelps Dodge Copper Products Corp.

Different types of semi-flexible air dielectric cable have been developed recently, among which, according to the authors are Styroflex cable, Styroflexible, Spirafil, and Foamflex. All of their designs incorporate a means of continuous axial support of the inner conductor, together with an aluminum tube, copper braid or corrugated metal outer shield. The characteristics and advantages of these cables were described.

"The Electrical and Mechanical Characteristics of Helical Membrane Cable." R. C. Mildner and R. J. Slaughter, Telegraph Construction & Maintenance Co., Ltd., England.

The construction and electrical characteristics of a range of aluminum-sheathed air-spaced coaxial cables, suitable for operation over a wide range of frequencies, were described, as well as the mechanical characteristics of these cables and the theory of differential expansion of a coaxial pair.

It was found that under conditions of no load the cable would meet all the conditions imposed by ambient temperatures ranging from —40 to 55° C. The cable can also be safely operated with power corresponding to the standard rating of the cable applied, but attention was drawn to certain potentially dangerous conditions of installation and operation. Reference was made to the extension of the working temperature range of these cables through the use of polytetrafluorethylene, the linear polyethylenes, and irradiated polyethylene.

"Military Applications of Silicone Rubber Insulated Wire and Cable." R. S. Naegele, J. F. Dexter, P. C. Servais, Dow Corning Corp.

Dielectric materials used to insulate wire and cable designed for current and future military applications were said to require the following properties: serviceability at high temperatures, flexibility at extreme low temperature, retention of dielectric and physical properties over a wide temperature range, corona resistance, weather resistance, fungus resistance, flame resistance, and resistance to deterioration by fuels, solvents, and hydraulic and lubricating oils.

Available silicone rubber materials meet most of these requirements, according to the authors, except for their poor abrasion resistance at room temperature and their tendency to soften and swell when exposed to most fuels and some hydraulic and lubricating oils. Military specifications MIL-C-2194B, MIL-W-16878, MIL-W-8777, and MIL-C-3162 are currently being met by silicone rubber insulated wires and cables now manufactured.

Extensive data were presented showing why silicone rubbers were being used as primary insulation for transformers, large industrial motors, and traction equipment, and the opinion that these rubbers would meet many more difficult wire and cable requirements was expressed.

"RF Power Ratings of Teflon Coaxial Cables." G. J. Mares and C. C. Camillo, American Phenolic Corp.

Teflon (polytetrafluorethylene) was said to have found extensive use in the manufacture of coaxial cables in both the electronics industry and the Armed Services because of its ability to withstand temperatures as high as 250° C., a considerable increase over the temperature resistance of polyethylene materials. The authors conducted an investigation to determine the power ratings of currently used Teflon dielectric cables after having developed new measurement techniques.

Details of these techniques were given. Measurements were conducted on both Teflon and polyethylene cables of equivalent types, and it was seen that the former had a greater power handling capacity. The use of Teflon over polyethylene wherever possible was therefore urged, especially in the case of large-diameter polyethylene cable, which could be replaced to advantage by a small-diameter Teflon cable, with considerable weight reduction, as well as increased maximum power capacity and a higher maximum operating temperature.

"Research Progress in Magnet Wire Enamels." H. L. Saums and W. W. Pendleton, Anaconda.

Organic synthetic polymer wire enamels have been developed to give added toughness, flexibility, heat stability, and resistance to a variety of environments, including moisture, solvents, other resins, and contaminants. In the past three years research and development in this field have been concentrated on thermal stability improvement, with the emergence of many new organic resin enameled magnet wires having long life expectancies in excess of 105° C.

In addition to the organic enamels, a series of modified silicone enamels has been made available, but these were seen to be in need of further improvement in mechanical properties. The authors themselves have united modified silicones with polytetrafluoroethylene to produce a magnet wire capable of operation at 250° C. with long life expectancy.

Caution was urged not to accept any new material solely on the basis of thermal stability, without a careful investigation of the mechanical, electrical, and chemical properties and their relation to the thermal shock properties of the enamels as applied to magnet wire. An example of such unwise use was reported.

"Transmission Characteristics of Rural Distribution Wire at Audio and Carrier Frequencies." John A. Brazee, Whitney Blake.

The author correlated the theoretical electrical behavior of plastic rural distribution wire and the actual measured characteristics. Primary and secondary constants,

representative of the wire during both dry and wet weather, were presented. The transmission characteristics of rural distribution wire were said to be generally more closely related to the 19-gage paper insulated cable than to the present open wire systems.

"Rural Wire and Urban Wire for Telephone Distribution Systems." A. P. Jahn, Bell Labs.

Both rural and urban distribution wires were said to be essentially similar in make-up and in the equipment and techniques used to install them. The wires are designated B Rural Wire and B Urban Wire to distinguish them for ordering and specification purposes. The physical difference between them is that rural wire has six pairs of No. 19 gage conductors, whereas urban wire has 16 pairs of No. 24 gage conductors. Each conductor is insulated with polyethylene followed by an outer covering of polyvinyl chloride.

Both wires are sheathless self-supporting cables for exchange distribution plant.

Comparative physical and electrical characteristics were presented, as well as reports of performance under actual operating conditions. Types of insulation were enumerated.

"Polyethylene-Insulated Telephone Cables." A. S. Windeler, Bell Labs.

Formerly multiconductor telephone cables were insulated with paper, applied as a helical tape, or laid down directly on the conductor in the form of pulp. Recently plastics and other polymeric materials have been studied as possible replacements for these cheap materials, and of these polyethylene has been selected as the most promising competitor because of its excellent electric properties, including low dielectric constant and power factor, high dielectric strength, impermeability to water or water vapor, availability, and reasonable cost.

The solid-polyethylene insulation has been introduced into the telephone plant for use where system savings will offset the higher first cost of the cable. The expanded polyethylene now is said to be the standard insulation for broadband video pairs. Also, expanded polyethylene-insulated 19-gage toll cables are being given extensive field trials.

"Protection Problems on Telephone Distribution Systems." J. W. Phelps, Bell Telephone Laboratories.

The use of polyethylene and polyvinyl chloride as conductor insulating and cable sheathing materials has made possible a reduction in the cost of protecting distribution wires and cables from the damaging effects of lightning and commercial power voltages. The techniques of protecting polyethylene-sheathed paper-insulated cables, polyethylene-insulated cables, and B Rural and B Urban wires were discussed and compared to the techniques of protecting paper-insulated cables.

It was shown that since many of the potentials which necessitated protection apparatus on paper-insulated conductors will do no harm to the plastic-insulated conductors, less protector maintenance expense will be required, and there will be less cable trouble.

"A User's View of Plastic Insulated Conductors in Outside Telephone Plant." R. Foulkrod, Michigan Bell.

Plastic-insulated conductors were first installed in 1951 in the company's toll outside plant and in its exchange plant in 1952. Subsequently the use of such insulation was extended to self-supporting, sheathless facilities for use in rural and urban areas.

The history of such applications as toll cable, exchange cable, rural wire, urban wire, and video pairs was discussed and the advantages of these applications were given. The author believes that plastic-insulated conductors, although higher in construction cost than paper- or pulp-insulated conductors, made overall operation of his company's plant better and cheaper.

"Measurement of Volume Resistivity of Plasticized Polyvinyl Chloride." C. E. Balmer and R. F. Conyne, Rohm & Haas Co.

The authors pointed out that early laboratory experience had shown that the reproducibility of volume resistivity determinations on plasticized PVC, under prescribed ASTM conditions of test, was poor, as was the correlation between volume resistivity values and insulation resistance values obtained on insulated wire. They therefore set out to develop a DC resistivity testing procedure which would yield results of practical significance.

The authors had three immediate objectives: to explore the variables influencing the reproducibility of volume resistivity determinations; to explore the effects of temperature and moisture on these results; and to evaluate the use of a molded copper foil sandwich test specimen.

A detailed description of the devised testing procedure was given. The procedure was shown to be relatively simple, requiring only a small amount of test compound and giving good reproducibility of results. In addition, these volume resistivity results showed good correlation with insulation resistance results obtained on samples of insulated wire.

"Spiral Multicolored PVC Wire." Gerard de Senarclens, Swiss Insulating Works, Ltd.

This paper described some of the recently achieved improvements in wire insulation used in telephone transmissions, especially in regard to distribution wires, switchboard wires, and certain cables. Most notable improvement is PVC insulation in permanent colors which permits rapid identification of the wires and their functions.

Today, the author declared, all distribution and switchboard wires are insulated with PVC; the first generally in one color; the second in a striped pattern extending spirally throughout the entire insulation. These multicolored wires are now being manufactured by many European producers, including the Swiss firm with which the author is associated.

Problems connected with the use of PVC in insulation, such as discharge of hydrochloric acid during soldering of the wire, the difficulty of uniform dyeing, and the lack of resistance to light on the part of the pigments, were eventually solved by the proper selection of the right PVC, plasticizers, pigments, and stabilizers.

"Crosstalk on Carrier Cables." K. E. Latimer, Submarine Cables, Ltd., England.

This paper was a brief survey of the theory of crosstalk at fairly high frequencies in quadded carrier cables, particularly those of the plastic type. The emphasis was on polyethylene-insulated, star-quad, polyethylene-sheathed cables in the 250-1000 Kc/s. range, with the formula discussed also applicable to other types of cable. Typical crosstalk figures measured on plastic carrier cables were quoted.

The less familiar aspects of the subject were chosen. Included were such topics as the methods of reducing system crosstalk, distinctions between segregated and non-segregated systems, the interchange effect, and spiral coupling. The author said much work was being done in the field in Germany, France, Holland, and Denmark.

"Recent Developments in Polyethylene Insulating Materials." R. J. Lurie and J. A. Snyder, Bakelite Co.

It has been found in high-pressure ethylene polymers that properties can be modified to some degree by varying the ratio of crystalline to amorphous constituents. A typical high-pressure process Bakelite polyethylene resin has a density of 0.92, corresponding to a crystalline content of about 52%. An increase in crystallinity, to about 75%, with a density value of about 0.95, can be brought about by a process involving lower-than-normal pressures. This material is known as a low-pressure polymer and appears to be particularly suitable for certain wire and cable applications.

The authors compared the low-pressure and high-pressure polymers in terms of a wide variety of physical properties, such as specific gravity, melt index, brittleness index, stiffness in torsion, yield strength, and stress cracking resistance, as well as electrical properties. The low-pressure polymer was shown to be more advantageous in such properties as improved low-temperature behavior, better retaining of strength and stiffness at higher temperatures, and a lower degree of expansion. Electrical properties were about the same.

The low-pressure polymer was also said to be less conducive to stress corrosion cracking. Mechanical properties were also improved, such as greater tensile strength, higher durometer hardness, and better stress-strain characteristics. The new polymer was said to make an outstanding supplement to the presently available polymers used for wire and service drop cable covering and could probably expand the potential use of polyethylene as a jacketing material over lead. Vastly improved factors of safety for momentary overload or high-temperature exposure were also seen for the low-pressure polymer.

"General Properties of the New Super-Polyethylene." G. H. Sollenberger, Koppers Co., Inc.

The author pointed out that the plastics industry must now acquaint itself with the full processing and application details of the new super-polyethylenes, such as the Super-Dylan polyethylenes, as it has done with other existing materials. He compared the physical and chemical properties of super-polyethylenes with conventional polyethylenes.

Concluding, the speaker asserted that the

super-polyethlenes offer an unusual combination of properties, such as improved heat resistance, greater rigidity, excellent low-temperature impact strength, high tensile strength, and excellent appearance. This combination of properties was seen to fill a long-standing need and was expected to complement other materials by broadening the entire spectrum of plastics use.

"Autogenous Extrusion." A. N. Gray, Western Electric Co., Inc.

Autogenous extrusion was defined as extrusion without external aid in the form of heating or cooling of the extruder during operation. This can be accomplished by designing an extruder screw that will receive material at room temperature and so heat and condition the material, through the power exerted by the drive, that the material will be ready for extrusion when it arrives at the exit end of the screw. A natural balance is thus established which is very stable, and output remains constant.

It was thought to be possible that some degree of autogenous extrusion could be accomplished with standard plastic extruders, but to take full advantage of all the virtues of the system, specially designed screws were deemed necessary. Drawings of the extrusion system were presented, and the theoretical and practical implications discussed.

The new system was said to be already in successful experimental operation. Its cost was claimed to be less than conventional extrusion units, and the quality and the uniformity of its end-products were known to be considerably superior.

"Developments in Submarine Communication Cables." J. J. Gilbert, Simplex Wire & Cable Co.

Among the developments in submarine communication cables during the past 25 years are improvements in insulating materials. All-rubber insulated cables laid during World War II were said to have proved very satisfactory. Paragutta, a mixture of deresinated balata, deproteinized rubber, and wax, has also been successful as insulation on carrier frequency cable and in other installations around the world, resulting in very good constancy of dielectric characteristics for considerable periods of time.

Polyethylene insulation has also been introduced, a great advance, according to the author. It is a synthetic product, free of the variations and contaminations to which natural products such as gutta percha, balata, and rubber are subject, and therefore eliminated the need of purifying processes which do not belong in a cable factory. Its one main weakness, difficulty of jointing, was solved through a pressure molding operation, by means of which a perfect blend was obtained between two polyethylene surfaces to be joined.

Other weaknesses were also solved. One of these rose from the fact that polyethylene is tougher than gutta percha and other insulating materials and tends to take control over the cable core when the latter is recovering from the elongation experienced in laying. Here the copper conductor was sometimes forced through the wall of insulation, causing a fault. Another trouble is that in certain environments polyethylene is subject to cracking under strain. These difficulties were not widespread, and preventative measures were found adequate.

"Development of Weather-Resistant Vinyl Jackets." E. E. Griesser and W. T. Higgins, Bakelite.

A rapid method for the development of weather-resistant vinyl compounds based on an established correlation of accelerated *vs.* actual weather performance was proposed. The ingredients of a typical vinyl compound were examined in terms of this accelerated test, and predictions were made for actual weather resistance improvement through proper selection of the resin, stabilizer, fillers, and pigments.

Plasticizer choice was based on compatibility, oxidation stability, and volatility tests. Finally, a list of stable colorants suitable for use in outdoor applications was reported. The actual combining of the best of these ingredients, as predicted by the accelerated test, has resulted in a compound vastly improved in actual weather resistance, according to the authors. Comparative tests were made without pigmentation so that differences in base formula could be seen more rapidly, but actual outdoor service will include only properly pigmented materials.

Life expectancy of these vinyl jackets is, of course, said to vary with geographic locale, but a minimum life of ten years was predicted in almost any environment, with little change in the mechanical properties of the materials.

Rhode Island Rubber Club Panel Discussion on Butyl Rubber—II

Butyl—Wire and Cable Extrusions

By Emil H. Schwartz
Southern Clays, Inc.

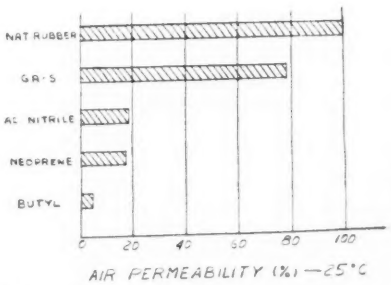


Fig. 1. Air permeability of various polymers at 25° C.

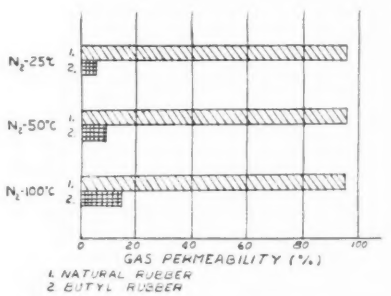


Fig. 2. Nitrogen permeability of natural and butyl rubbers at 25, 50, and 100° C.

In the time allotted we are going to answer one pertinent question which was solicited by your committee by showing you some illustrations which deal with the properties of butyl rubber—quite different from some of the other polymers you use in your daily compounding and insulation problems. As a matter of fact, not only are the polymer properties different, but, as you are well aware, some of the vulcanizing agents used in this polymer are far different from those normally used in other insulations.

High-Temperature Mixing

For example, to answer this question submitted: "When mixing in a Banbury, we run our temperatures higher than we normally would to drive out any moisture. Why?"

From an article, "The Effect of Fillers on the Permeability of Rubber to Gases," by G. J. van Amerongen, Rubber Foundation, Delft, Netherlands,[8] we have reproduced two illustrations.

In Figure 1 you see the permeability of different types of polymers to air at 25° C., and it is quite apparent that with natural rubber it is 100%; GR-S type rubber, 75%; the nitrile rubber about 18%; neoprene, 15%; butyl, 5%.

In Figure 2 we show the nitrogen gas permeability of pure-gum natural rubber *versus* gum butyl at three different temperatures: namely, 25, 50, and 100° C. From these data it is only too apparent that the passage of gases through a mass of butyl polymer is very low. Air, admixed, and surface moisture on the fillers, entrapped in the normal procedure of mixing will not *permeate* through the mass of butyl compound unless the temperature is raised to induce better vapor gas transmission rate.

High-temperature mixing is essential to prevent vapor and gases being entrapped in the wall of extruded insulation, before vulcanization takes place. Apart from the vapor or gas transmission rate of butyl rubber being quite different from those of other polymers, we have still another reason why high-temperature mixing is so desirable for butyl insulation compounding.

[8] *Rubber Chem. Tech.*, July-Sept., 1955, p. 821.

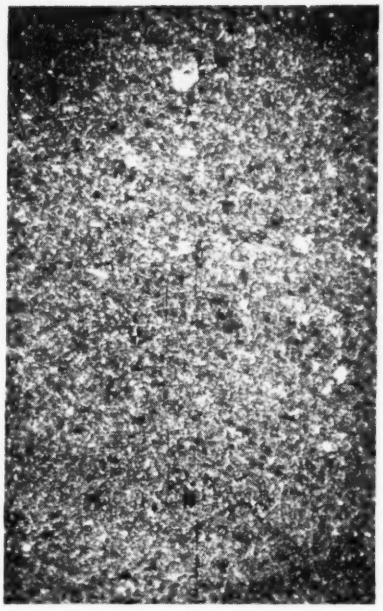


Fig. 3. Example of poor dispersion in unvulcanized butyl rubber stock mixed at conventional temperatures. No vulcanizing agents yet added. (50 magnifications)

Figure 3 shows the effect of low-temperature mixing—and this is the usual procedure for most other polymers. Figure 3 shows a piece of unvulcanized butyl rubber base stock with no vulcanizing agents added. In order to get a suitable specimen the compound was subjected to dry ice, which procedure gave us about —40° F., microtomed, which is not easy, and photomicrographed at 50 magnifications. What you see here can hardly be called good dispersion.

Since the so-called scrubbing effect in the mixer is low with butyl rubber, the increased temperature with high-temperature mixing flows the polymer around the nonblack fillers to get the essential coating or dispersion. Most certainly our fundamental concepts, that the best possible dispersion gives the best physical and electrical properties, must be applied to butyl as well as to any other rubber insulation.

I believe these facts help to answer the question on hot mixing of butyl polymer.

Curing Butyl Insulaton

In connection with curing systems for butyl rubber insulations, the quinone-red lead (Pb_3O_4) vulcanizing agents are most widely used since they give the best vulcanizate electrical properties for use in meeting present specifications. There is a considerable difference in the properties and the method of handling of these vulcanizing agents as compared to organic accelerators used in natural or GR-S type rubbers.

The quinones used, GMF[9] and DiBenzo-GMF,[9] have no definite melting points; only their decomposition temperatures are listed. Since organic accelerators are definite chemical compounds, they have very definite melting points in direct contrast to the quinone compounds. There is a point many degrees above the melting point of organic accelerators which gives a softening point or plastic effect to aid dispersion. Such is not the case with the quinones or red lead.

To overcome this particular difficulty with the vulcanizing agents used, quinone and red lead, masterbatching has been recommended. These materials are prepared in high concentrate masterbatches, and two parts of the masterbatch are used with one part of butyl polymer.

However, we wish to show you two additional illustrations which will indicate the reasons why we now must amend or change this procedure.

In Figure 4 we show a vulcanized high-voltage butyl insulation which failed on certain voltage tests. Figure 4 is a photomicrograph at 50 magnifications. Note the black specks which were first adjudged agglomerates of carbon black. We were able to dislodge some of these black particles, and a qualitative examination revealed them to be GMF.

This GMF was masterbatched in butyl rubber and added to the base stock on a rubber mill, preparatory to extrusion. A few more tests revealed the Mooney viscosity on the base stock was 30-35, and that of the masterbatch was 60-65. You *just can't mix marbles with putty*. In order to use this masterbatch and obtain good dispersion, it should be softened with additional plasticizer to bring the resultant Mooney viscosity closer to the Mooney viscosity of the base stock.

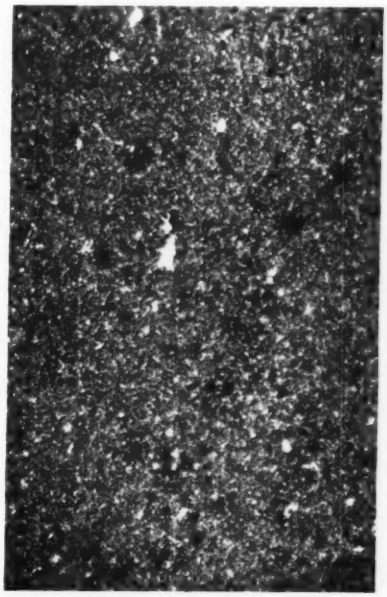


Fig. 4. Example of poor dispersion in vulcanized high-voltage butyl rubber insulation stock mixed in conventional manner, but made from GMF butyl masterbatch of 60-65 Mooney viscosity mixed with base stock of 30-35 Mooney viscosity. Black specks are GMF, not carbon black agglomerates. (50 magnifications)

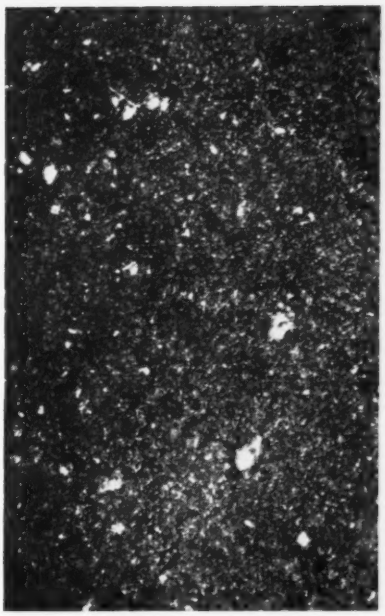


Fig. 5. Another example of poor dispersion of red lead in a butyl insulation stock mixed by conventional methods (50 magnifications)

Figure 5 shows red lead, mixed under the same masterbatching conditions. Here again is evidence of poor dispersion.

As a result of this evidence, we are recommending use of the present commercial dispersions of such fine electrical vulcanizing agents as GMF, DiBenzo-GMF, and red lead called Ken-Mixes.[10] These mixes are highly dispersed in a good electrical plasticizer, and their use in compounding butyl insulation results in very good dispersion. Of course some of the softener should be removed from the base stock if you use these dispersions in order not to exceed the total amount of plasticizer specified.

We are not advocating that you prepare photomicrographs of every batch of butyl you mix, but in your developmental work have a look under a microscope to ascertain at least whether you are doing as good a dispersion job as required.

Summary

In connection with the use of butyl polymer for electrical insulation, we have tried to emphasize some of the differences between butyl properties and processing and some of the other polymers used for this purpose. Rubber technologists, instead of complaining of these differences where they necessitate the development of new methods, they should accept them as a real challenge. Such situations are normal in the course of development which has confronted us since the advent of synthetic polymers. Rather than attempting the mixing, tubing, and vulcanizing of butyl compounds by the so-called normal procedure, keep in mind the fundamental differences between butyl and other polymers, and when proper procedures are worked out,

[9]Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
[10]Kenrich Corp., Maspeth, N. Y.

you will get a dielectric with real electrical properties coupled with excellent aging and heat resistance.

Questions and Answers

Q. What effect has calcined magnesia on cure, aging, and moisture absorption of butyl rubber vulcanizates?

A. Schwartz. In the quinones-red lead curing system metallic oxides, such as calcined magnesia, will have a mild retardation effect on the cure. We must remember that in open steam cures, and I emphasize, *open steam*, alkaline materials, whether they be amines or some of the metallic oxides, retard, while the acidic materials accelerate the cures in the quinones vulcanizing system. Much, of course, depends on how much calcined magnesia is used.

If much over 2% of calcined magnesia on the butyl polymer is used, it can increase the moisture absorption of the vulcanizate, especially if good dispersion of the oxide has not been obtained.

The aging of the compound will not be very greatly changed by small additions of this oxide, provided there is made a correction for the retardation effect of the cure.

Before hot mixing of butyl insulations was developed your speaker used calcined magnesia to eliminate porosity and surface blistering. It was a natural consequence inasmuch as with the older rubber-factice combinations such things as oyster-shell lime or calcined magnesia, along with litharge, were used to overcome porosity. With the new hot mixing procedure and dispersion consciousness, calcined magnesia certainly is not needed for this purpose.

Q. What is the effect of sulfur content on the cure, aging, and stability of butyl compounds?

A. In the organic acceleration system for curing butyl polymers, tetramethylthiuram disulfide is used, with mercaptobenzothiazole as a coaccelerator, and one to two parts of sulfur on the polymer can be used. This combination, properly vulcanized, will stand a 96-hour oxygen aging test or a seven days' heat oven test at 95° C.

If air bomb tests at 250° F. (125° C.) are required, then it is best to reduce the sulfur considerably and work with the selenium and tellurium derivatives of dithiocarbamic acid. These derivatives are more dispersible than the sulfur vulcanization substitutes for sulfur, metallic selenium, or tellurium.

In the quinone-red lead vulcanizing system, consisting of GMF, Altax,[11] and red lead, 1½-2% of sulfur will accelerate the cure, increase the tensile, but the air bomb aging is not so good as with only token amounts of free sulfur present (below 0.5%). The water absorption of the vulcanizate, when more than 1% of sulfur is used in this system, is definitely increased, and electrical stability is poor.

Such is not the case with the DiBenzo-GMF system when red lead only is used. Here 1-1.5% of sulfur must be used to get adequate vulcanizate cure and good physicals. The water absorption or stability of the vulcanizate is not affected with this amount of sulfur, and the air bomb aging results are excellent. Never use thiazyl disulfide coacceleration with DiBenzo-GMF, red lead, and sulfur as the aging and electrical stability of such vulcanizates are poor.

Emil H. Schwartz

Q. What will prevent the distortion of butyl rubber compounds after insulation and during vulcanization process?

A. I assume this question refers to curing wire and cable insulation in pans or on drums.

The best way to cure butyl rubber insulation is in continuous vulcanizing equipment. Since the quinone-red lead system with Enjay Butyl 035 is slow curing, it is difficult to cure in pans or on drums and prevent distortion. Increased amounts of prereacted Polyac[12] will stiffen the stock sufficiently to cure in pan, provided a good panning job is done, not too many layers are used, and each layer is covered with clean talc or soapstone. The talc or soapstone must be new to keep away natural or GR-S type rubber particles, grease, sulfur, and organic accelerator contamination.

In heavier cables you can get considerable protection against distortion by using cable tapes, wrapped on the cable in tandem with tubing machine and then reeled on a drum, and the same rules apply here as with all rubber cables. Tensions must be watched, and the diameter of the drum must be large enough so that the underneath layer of the cable against the drum is not too tightly bent.

Very large, heavy walls of butyl insulation have been vulcanized in lead sheath, and after cure the lead stripped off. This procedure is the same as is used in curing high-quality dredge mining machine or shovel cables.

It is my understanding that there will be available very soon extrusion machines connected with continuous vulcanizing machines which will extrude this type of insulation downward—and this type of processing will make good butyl cable with the minimum of distortion.

Q. How can butyl rubber be extruded with a fairly smooth surface, and what are the best extruder barrel, worm, and die temperatures that should be used?

A. Butyl rubber can be fed into the tuber either cold or hot for extrusion. Cold feeding of the stock calls for the use of extruders with longer barrels and screws so that the stock can be worked a bit and acquire the necessary plasticity before entering the head.

The temperatures in the tuber for either type of extrusion are much lower than those used for other polymers.

The screw must be of double flight, shallow design to get the most uniform feed, whether a cold or hot feed is used. Representative temperatures follow: barrel, 130° F.; head, 160° F.; and die, 160-175° F. Hot mixed butyl rubber compounds generally extrude best, since they are soft, but dense.

A word about dies. To get the smoothest surface, a good rule to follow is to select a die about 15% smaller in size than the overall diameter of the extrusion. In a 500,000 CM cable, maximum swelling was 20 mils—which, based on wall thickness of the rubber insulation, was about 15%.

Q. What precautions are necessary in mixing or processing butyl rubber on equipment used interchangeably with GR-S type rubber?

A. Contamination of butyl with either natural or GR-S type rubbers must be avoided. As little as 1% of a GR-S type compound mixed with butyl will have a marked effect on the cure of the mixture.

The Banbury must be thoroughly cleaned, and if you use smoked sheets or GR-S type rubber to clean it, make sure the rotors packing glands and gate are entirely free of the cleaning rubber before a new butyl batch is mixed.

The rolls of two-roll mills must be clean also. The guides of such mills must be clear, and the pan under the rolls must be very clean, and sulfur dust and accelerator particles must be entirely eliminated. Very often there is a surface scum on mill rolls which cannot be cleaned with the so-called cleaning batches of rubber. The mill rolls must be cooled and scrubbed with solvent to remove this scum.

Q. If one were having difficulty in obtaining stability of insulation resistance at 75° C., would you say the best place to make corrections would be in compounding?

A. The compound in an Underwriters Laboratory Code RH-W insulation stock is a simple one. On 100 parts of Enjay Butyl 035 polymer, you use five parts of a zinc oxide. Five to 10 parts of FT black should be used to get best heat aging, and the balance of the compound, if you will pardon my saying so, should be Southern Clay's Whitetex #2 along with paraffin, a good grade of plasticizer for electrical insulation, and perhaps some sun-check wax. The chances are the variation in insulation resistance mentioned is not due to the compound used.

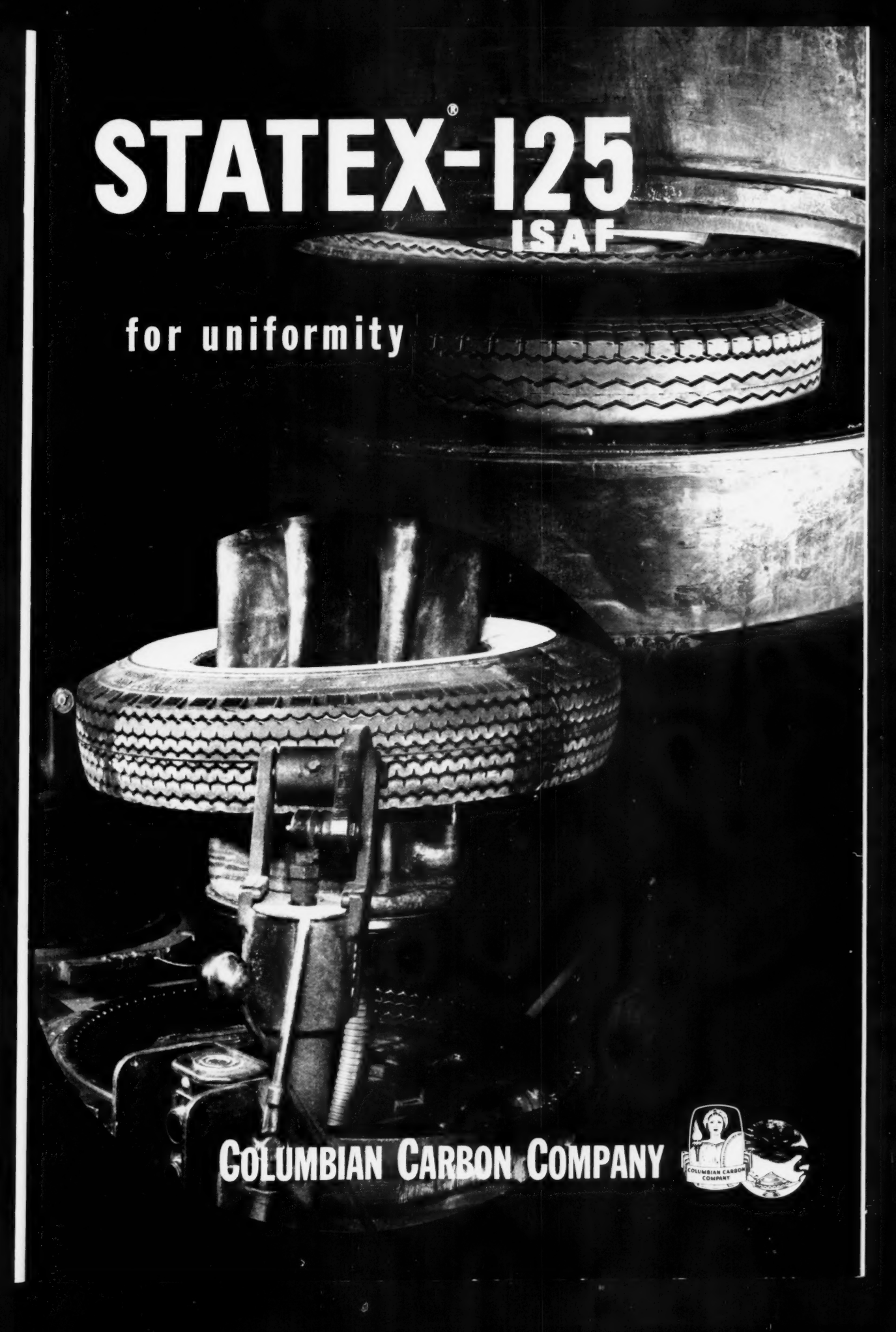
I would like to suggest some answers by asking you in turn some questions: (1) Did you hot mix your base stock? (2) Is your base stock adequately dispersed? (3) What system of quinone acceleration are you using? If it is GMF, Altax, red lead—are you using high sulfur to get higher physicals or faster cures? (4) Have you looked at your mixed stock under the microscope to see if your accelerators are really dis-

[11] R. T. Vanderbilt Co., New York, N. Y.
[12] p-Nitrosobenzene with inert fillers, E. I. du Pont de Nemours & Co., Inc., elastomers division, Wilmington, Del.

STATEX®-125

ISAF

for uniformity



COLUMBIAN CARBON COMPANY

STATEX®-125 ISAF
(Intermediate Super Abrasion Furnace)

STATEX-R HAF
(High Abrasion Furnace)

STANDARD MICRONEX® MPC
(Medium Processing Channel)

MICRONEX W-6 EPC
(Easy Processing Channel)

STATEX-B FF
(Fine Furnace)

STATEX-M FEF
(Fast Extruding Furnace)

STATEX-93 HMF
(High Modulus Furnace)

FURNEX® SRF
(Semi-Reinforcing Furnace)

COLUMBIAN CARBON COMPANY
380 Madison Avenue, New York 17, N. Y.

persed? (5) Do you have a good tightly cured stock, or are you encountering porosity? (6) If your cured stock is porous, try curing the insulation after it comes off the CV cure, for about seven days at 70° C.

It is not so much what you put in your compound, but how you put your ingredients together and how well you operate your vulcanizing process.

Q. In sulfur thiuram cures on black butyl jacket stocks, what can be done to improve the slow recovery from deformation of such stocks?

A. The use of black butyl jacket stocks first appeared in certain government specifications for wire for use in aircraft where low-temperature flexibility at —65° F. was important. Since then there has been some demand for corona resistant stocks, calling for butyl jackets.

If no coaccelerator was used in the black butyl jacket stock, then its absence definitely accounts for the slow recovery from deformation. Try mercaptobenzothiazole with the thiuram accelerator. If this combination of the stock is scorchy, substitute benzothiazyldisulfide for the MBT. If neither of these combinations satisfies your requirements, use a butyl polymer with more unsaturation than Enjay Butyl 035.

Q. What is the future of butyl rubber in wire insulation?

A. The use of butyl rubber in the field of high-voltage insulation is definitely increasing, and the future looks exceedingly good. Good aging, good heat resistance, and a very high order of insulation resistance, coupled with the excellent corona resistance of butyl rubber, give you a very salable combination.

Some companies in their desire to make these premium wire and cables have neglected, however, to study some very fundamental factors. As technical men, in the high-voltage field, you know that for severe conditions such factors as corona level, long-time stability tests in both wet and dry environment, Schering bridge measurements at different voltage levels to measure dielectric losses, and, what is more important, field experience and application engineering are of great significance. The overall picture of experience with butyl high-voltage cables has actually been quite good.

The question might be asked, why use butyl rubber for low-voltage (300-600) insulation when natural or GR-S type rubbers might be adequate? Actually, there are good technical reasons for preferring the butyl rubber insulation for this application.

Did you know that in certain areas of the West and Southwest, 600-volt building wire and feeder cables made with natural and GR-S type rubbers in conduits and ducts have had to be pulled out at great expense because the surface of the insulation was cracked? Some of these wires have been installed only for a year or less. These failures are certainly not electrical in nature at a maximum operating voltage of 600. It is perhaps a combination of conditions and some high ozone concentration in the local atmosphere. Here butyl Underwriters Laboratory Code RH-W insulation has given an excellent account of itself thus far, and its use most certainly will repay its cost manifold.

Then we must not overlook the possibility of future developments. As new butyl polymers are developed, our fundamental knowledge of compounding is increased; our field experience is broadened; and since basically butyl rubber is a good polymer for electrical insulation work, the future for butyl rubber looks very bright indeed.

Q. What butyl polymer should be used when you are compounding a wire and cable insulation requiring both maximum ozone and maximum heat resisting properties?

A. We believe that to obtain the best ozone resistance coupled with the maximum heat resistance it is best to use Enjay Butyl 035 polymer with the quinone-red lead curing system.

Q. How can corrosion of the tinned or alloy coated copper conductor under butyl insulated wire best be avoided or minimized?

A. In using CMF, red lead, without sulfur or very small amounts of sulfur for curing butyl insulation, there is less tendency for the so-called corrosion effect. However, in the DiBenzo-GMF system where 1.0 or 1.5 parts of sulfur are used, it is best to use pure tin coatings.

As a matter of fact, there is a difference of opinion on this corrosion effect. The alloy coatings are softer on the surface than pure tin, and the adhesion of butyl compounds is so great that, in stripping the rubber from the conductor, a minute layer of the alloy coating is pulled off with the rubber, which gives the corrosion effect with the usual discolorations.

The safest procedure is to use pure tin coatings with these wires and cables; while with the DiBenzo-GMF curing system for the insulation, lower sulfur should be used to avoid corrosion of the metal coating of the copper wire.

Q. How can electrical corona resistance and high-voltage fatigue be improved with butyl insulations for electrical wires?

A. The best corona resistance of any rubber compound, whether it be butyl or not, is obtained by controlling modulus. In general it can be said that for any one given butyl insulation, at a definite ozone concentration, the lower the modulus, the longer will this insulation last, without cracking. There are many unvulcanized rubber compounds which are quite corona resistant because there is very little stress, and the ozone does not attack under these conditions, but the insulation has to be vulcanized.

Many technologists disagree with this statement and feel butyl insulation is very corona resistant at any given modulus. You can see that what I am trying to stress here is degree of resistance.

High-voltage fatigue of butyl insulation has been given considerable study of late. The choice of carbon blacks in this connection is most important. Channel blacks, with their surface oxygen, when hot mixed, or given the thermal treatment, form cross-links which help increase voltage breakdown considerably. Concentration of this-type black, of course, must be limited in insulation for several reasons. In using the furnace carbon blacks, with promoters such as Polyac, or other oxygen carriers, the same type of difficulty may result.

Butyl polymer is significant in that up to 30 parts of black on 100 parts of polymer can be used without seriously affecting insulation resistance, provided the black is well dispersed. But to come back to limitations of the amount of channel or furnace black used:

(1) The heat resistance and the air bomb aging of channel and furnace carbon blacks are not so good as those for the thermal carbon blacks.

(2) The dielectric constant and power factors of high-voltage insulation compounds are increased by excessive usage of these blacks. It is not the original power factor value that counts most, but the % increase of the original value, under applied voltage or under conditions of such tests as the International Power & Cable Electrical Association stability tests.

Practical insulation must have balance to meet all phases of any one given specification. Blends of channel, furnace, and thermal carbon blacks are being used up to 15 to 18 parts on 100 parts of polymer to produce insulation with good electrical stability and aging.

High-voltage fatigue improvement is not entirely a matter of compounding. Many types of fairly heavy walled cable, run on continuous cure equipment, apparently are not cured to an optimum state. In many cases a long dry heat cure at 250° F. will vastly improve resistance to high-voltage breakdown of the insulation.

To sum up the situation, you have a specification to meet which involves many electrical factors, such as voltage breakdown, which, by compounding alone, by using the best blacks for this purpose, may increase the modulus at the expense of corona resistance and perhaps even deteriorate heat aging. For instance, only recently I have seen cables which had excellent electrical properties, but did not retain 80-90% of their original elongation in the 20-hour air bomb test because of type and amount of carbon black used.

Q. What physical aging or electrical properties are improved, and what properties are depreciated by hot mixing butyl insulation, as compared with conventional lower temperature mixing?

A. The temperature at which mixing takes place in an internal mixer should be governed by how good a job you do in dispersion and getting rid of entrapped gases and moisture and should also control the time in mixing. We would definitely recommend elimination of internal-mixer recording chart on temperature as the sole guide in temperature, as experience has taught us two very important facts:

(1) These recording charts are connected to a bulb in the mixer, which bulb usually has inadequate contact with the entire mass of stock. The difference between chart and actual stock readings can be as much as 50 to 100° F. In addition, sometimes these recording charts have not been recalibrated since the installation of the mixer.

(2) A surface pyrometer on the sheeting mill or a needle-point long-arm pyrometer, will give much more accurate results, provided, of course, that these instruments are properly calibrated.

By experience, we know that actual stock temperatures of 300 to 350° F. give good results. We must caution, however, that where the internal mixer charts showed these temperatures, the actual tempera-

ture was well over 400° F., and since the stock was in the mixer some 20 to 25 minutes and was dense, well dispersed, and gave smooth extrusions, it was deficient in tensile strength. In this case there was no sulfur added in the mixer in order to get low water absorption, good electrical stability, and the minimum of corrosion of the conductor. If 1% to 1.5% of sulfur had been used in the compound, degradation of the base stock would have been avoided.

With normal mixing as used with insulation compounds made from polymers other than butyl, if you add the various fillers directly into the mixer, you will not get suitable dispersion or a dense, gas and moisture free stock. If conventional lower temperature mixing of insulation compounds must be used, best results are obtained when you prepare high-concentrate masterbatches of each ingredient used in base stock and then blend the masterbatches together. The Mooney viscosities of the various masterbatches must not be too different in order to get a suitable final blend. We do not consider this method practical, however, and it will increase cost.

As to aging or electrical properties, these are connected with the following considerations: (1) good dispersion of base stock to give dense and gas and moisture free extrusions; (2) a high degree of dispersion of your accelerators and this includes red lead; (3) state of cure; (4) proper choice of the blacks used in base compound.

As we see it, the above four considerations are important in themselves, and, therefore, aging and electrical properties are not directly related to either hot or conventional lower-temperature mixing as such.

Q. What are the peculiar effects of Polyac in butyl insulating compounds, and what is the recommended procedure for its addition?

A. There are a great many different diversified opinions on this subject. Here are the peculiar effects:

(1) Polyac will react with butyl polymer, forming cross-links, which tend to stiffen the mixes. This characteristic, some feel, aids dispersion in the Banbury base stock mix.

(2) At temperatures roughly above 270° F., Polyac reacts with the butyl polymer, without aid of other accelerators, to create this cross-linkage, with an exothermic effect. Usually the temperature of the stock in the Banbury rises very rapidly until the reaction is complete.

(3) The Mooney viscosity of Polyac prereacted butyl stock is much higher than that of stock without this chemical.

(4) Where Polyac is prereacted, means for control of the temperature of the mix above 270° F. must be available, because if any free Polyac is left in the stock, scorching will take place on the sheeting mill or in the extruder. Experimentally, an Enjay Butyl 035 stock, which is the slowest curing butyl polymer, can be vulcanized in 1-2 minutes in a laboratory press at 300° F. This stock need contain only about 0 to 0.1 to 0.15% of Polyac on the rubber to get this cure, but the incorporation of this accelerator as free Polyac must be done on refrigerated rolls. It would be impossible to extrude this compound without scorch.

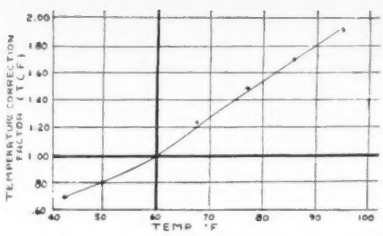


Fig. 6. Temperature correction factor for high-voltage butyl insulation

(5) Where larger amounts of Polyac are used, say from 0.4 to 0.5% on the rubber, the modulus is increased, and the elongation decreased on the vulcanizate.

(6) Prereacted Polyac butyl stocks are more difficult to extrude because of the increased plasticity.

(7) There is a great difference of opinion as the best procedure for incorporating the Polyac. The newest type of Polyac—the active chemical dispersed in wax, disperses very readily at the beginning of the Banbury cycle and will begin action in this dispersed state when proper temperature is reached. This characteristic of the Polyac dispersed in wax is important because it eliminates "localized" spots.

(8) Polyac will serve as an oxygen carrier in carbon blacks which are low or deficient in surface oxygen. Polyac is known as a "promoter" and serves a most useful purpose with furnace or thermal carbon blacks as compared with channel blacks which carry their own surface oxygen.

Q. The insulation resistance of butyl rubber compounds decreases with increasing temperature. Is this the general trend with other polymers? Does the correction factor curve follow a straight line, or is the curve exponential at more elevated temperatures?

A. Butyl polymer insulations do follow the general trend of all rubber insulations in that insulation resistance decreases with increasing temperatures.

In reply to the second part of the question, above 60° F. (15.5° C.) the temperature correction factor is, to all intensive purposes, a straight line. Below 60° F., there is a slight bend in the curve. For this part of the curve, the *minus* correction factors below 60° F. are fairly typical of many other polymers.

Just a word as to how the temperature correction curve is determined. A well-selected piece of wire, usually of smaller diameter sizes, which has shown good electrical characteristics, is lead sheathed with a thin layer of the metal. This sheathing is done to eliminate all factors of error based on water absorption. The leaded wire is cut into two separate lengths, usually about 25 feet each, and immersed into a water bath, with a very sensitive thermostatic control, in order to reduce to a minimum variation in the water temperatures. The wire is kept at selected temperatures, 5° to 10° F. intervals apart, for several hours in order to be sure equilibrium temperature conditions are achieved at each temperature. Readings of insulation resistance are taken at each temperature on a high sensitivity laboratory bridge. The other length is kept in a separate bath for temperatures below 60° F., and readings are taken in the same manner.

Figure 6 is a temperature correction factor curve for high-voltage butyl insulation.

(To be concluded)

Patent Examiner Shortage Handicapping Industry

There are immediate openings as patent examiners in the United States Patent Office for young graduate engineers and scientists, the New York Patent Law Association has revealed in a statement stressing the critical shortage of such qualified examiners and its possible dire effect on the progress of American industry.

Starting salary of patent examiners is $4,345 a year, with advancement to $7,570 possible in 5½ years. Liberal vacation periods and sick leave and pension benefits are also being offered. A college degree in engineering or in the applied sciences is required. Vacancies are filled by appointment, with no examination necessary.

According to the Association, the great increase in the number of industrial patent applications filed in the past few years, together with the shortage of examiners, has stretched the average prosecution time for each patent to 3½ years.

This delay creates uncertainty as to the patent status of new products and processes and tends to slow down or defer their adoption by industry and their introduction to the public, the Association adds. The situation handicaps large corporations and is often critical to the individual inventor and to the small business whose operations revolve around patented products and processes.

Applications for appointment as patent examiner should be addressed to the Commissioner of Patents, United States Patents Office, Washington, D. C.

Synthetic Organic Award

An annual award "to recognize and encourage creative work in synthetic organic chemistry" has been created by the Synthetic Organic Chemical Manufacturers Association, New York, N. Y. The award will be administered by the American Chemical Society.

The award will be made for creative work in synthetic organic chemistry published in an American journal during the preceding three years ending January 1 of the year in which the selection is made. The first award will be made in 1957.

The award will consist of $1,000, a certificate, and a gold medal. Suitable traveling expenses will be furnished the recipient. The SOCMA research committee, which created the award plan, consists of Ernest M. May, Otto B. May, Inc., chairman; Alvin H. Tenney, Carbide & Carbon Chemicals Co.; and August Merz, American Cyanamid Co. R. W. Hooker, Hooker Electrochemical Co., is president of the Association.

GR-S Address by D'Ianni Given at Swedish Meeting

James D. D'Ianni, assistant to the vice president in charge of research and development for The Goodyear Tire & Rubber Co., Akron, O., addressed the Swedish Institution of Rubber Technology, December 9, on "Current Status of GR-S Developments in America."

Among the other speakers on the program was R. P. Kenny, B. F. Goodrich Co., Paris, France, who discussed "Ameripol SN—A Synthetic Cis-1, 4-Polyisoprene," a talk similar to the one presented by Goodrich's F. K. Schoenfeld at the November 3 meeting in Philadelphia of the Division of Rubber Chemistry, American Chemical Society, on November 3.[1]

Dr. D'Ianni reviewed the sale of government synthetic plants to private industry and estimated that by the end of 1957, GR-S type rubber production capacity in the United States would reach the 1,100,000-ton level, including oil content rubber and production at the Institute, W. Va., facilities.

He revealed that his own company was planning another 25% expansion of its Houston, Tex., GR-S type rubber plant, in addition to the one already announced, ultimately raising the plant's production capacity to a figure in excess of 200,000 tons a year, including the oil content of oil-GR-S type rubber masterbatches.

He said that the availability of synthetic rubber outside the United States, either through importation from the U. S. or the establishment of synthetic rubber plants in other countries, would continue to increase throughout the years ahead, especially since it is problematical whether natural rubber production can be substantially increased to cover foreseen requirements.

Delving into research developments, he said that exhaustive tests on the Goodyear test auto fleet had demonstrated conclusively that passenger tires with GR-S treads containing HAF black exhibit equal or superior tread wear when compared to passenger tires with natural rubber treads containing EPC black.

In small truck treads GR-S was being tested in the tread cap and base of 8.25-20 and smaller tread sizes with satisfactory results, and it was believed that in over-the-road truck tires of 9.00 size and larger, substantial amounts of cold GR-S, perhaps up to 50%, could be used in tread stocks, depending on operating conditions. These, however, were tentative conclusions, the speaker cautioned.

On the issue of synthetic rubber latices, he said that U. S. producers definitely preferred them to natural latex in tire cord dips because they give more uniform dip emulsions with outstanding mechanical and chemical stability, when properly formulated.

Dr. D'Ianni asserted that no discussion of synthetic rubber today would be complete without reference to the new syntheses for *cis*-polyisoprene announced last year. He disclosed that the Firestone version of this synthesized natural rubber employed lithium as a catalyst in the bulk or solution polymerization of very pure isoprene.

Although both Firestone and Goodrich have reported that the rubber performs satisfactorily in heavy-duty truck tires, Dr. D'Ianni cautioned that no one can yet state unequivocally that all the physical properties and performance data will be identical with those of tree-grown rubber.

James D. D'Ianni

Concluding, he stated that continuation of intensive research and development efforts in the GR-S field will unquestionably extend the range of application of these polymers beyond anything contemplated heretofore.

"In the final analysis, the coming battle between natural and synthetic will be fought over the twin factors of price and performance," he declared. "The old master, natural rubber, will find the young upstart, synthetic rubber, a most formidable competitor."

[1]RUBBER WORLD, Oct., 1955, p. 82; Dec., p. 397.

ACS 1956 Priestley Medal to C. S. Marvel

Carl Shipp Marvel, research professor at the Noyes Chemical Laboratory of the University of Illinois and an authority on synthetic polymers, has been named winner of the American Chemical Society's Priestley Medal for 1956 for his "distinguished services to chemistry," it has been revealed by John C. Warner, ACS president, who is also president of Carnegie Institute of Technology. This medal will be awarded Marvel during the one-hundred twenty-ninth national meeting of the Society at Dallas, Tex., sometime in April.

Professor Marvel is credited with directing an important part of American research on synthetic rubber during World War II.

Major contributions to the development of plastics of the vinyl polymer type are also attributed to the Illinois researcher. These plastics are now being used in the production of transparent aircraft pieces, as rubber substitutes, and as thickening and blending agents in chemical manufacturing.

Other of his research achievements include the development of practical methods for preparing amino acids, investigations into the relation between hydrogen bonding and solubility factors, studies of synthetic diets employed in intravenous feeding, and coordination of research on the synthesis of antimalarial drugs.

Professor Marvel, ACS president in 1945, won the William H. Nichols Medal of the ACS New York Section in 1944 and the Willard Gibbs Medal of the Society's Chicago Section in 1950. A prominent editor of numerous scientific journals, he has written more than 150 scientific and technical articles. He has been a member of the ACS for 41 years.

New Philadelphia Course

A new college-credit course in basic rubber technology has begun at Villanova University under the sponsorship of the Philadelphia Rubber Group. Included among the 18 lecturers are B. S. Garvey, Sharples Chemical Division of Pennsylvania Salt Co.; H. S. Yuen, Villanova University; P. G. Carpenter, Phillips Petroleum Co.; A. R. Davis, American Cyanamid Co.

Also John Snyder, Columbian Carbon Co.; Gus Maassen, R. T. Vanderbilt Co.; P. D. Bowers, The Firestone Tire & Rubber Co.; A. L. Back, American Foam Rubber Co.; George Daum, The B. F. Goodrich Chemical Co.; George Konkle, Dow Corning Corp.; John Ball, Midwest Rubber Reclaiming Co.; J. R. Panek, Thiokol Chemical Corp.; Ralph F. Wolf, Columbia-Southern Chemical Corp.; and F. M. McMillan, Shell Development Co.

The course carries a two-semester hour credit toward a master's degree in chemical engineering for those interested in such credit. The cost of the course is $30, and the compiled lectures will be sold for an additional $3.

International Atom Course

An intensive course on atomic energy will be given for foreign business executives at the Westchester Country Club, Rye, N. Y., February 27-March 3, under the sponsorship of the National Industrial Conference Board. The course will be repeated April 30-May 5.

Consisting of lectures, demonstrations, and discussions, the course will be conducted by a faculty of prominent scientists, engineers, and businessmen, both American and foreign. A tour of the Brookhaven National Laboratory is also scheduled. English will be the language used for all sessions.

The course, patterned after similar ones held by NICB in 1955 for American and Canadian businessmen, will concern itself with the industrial applications and economic significance of atomic energy and will be geared for the non-scientifically trained. The fee is $465.

Further information and registration forms may be obtained from the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y., or by cabling NICBOARD, New York.

Mixing, Processing Trends Subject of Chicago Talks

The Chicago Rubber Group meeting of November 11, 1955, was devoted to the subject of "Trends in Rubber Mixing and Processing," with E. H. Ahlefeld, Jr., Farrel-Birmingham Co., and John Drew, National Rubber Machinery Co., as the speakers. About 210 members and guests of the Group were present at this meeting.

High-Pressure Mixing

Mr. Ahlefeld first pointed out that Farrel-Birmingham feels that in order to obtain good dispersions of pigments and fillers in rubber compounds mixed in the Banbury mixer the maximum amount of work should be expended on the mix, and this is best obtained if the mix is relatively stiff. Among the ways used to keep the mix stiff until good dispersion is obtained are mixing at as low a temperature as possible, adding softeners at the end instead of beginning of the mixing cycle, and removing the batch for cooling and returning it to the Banbury for further mixing.

The so-called high-pressure or high horsepower mixing work done during the past three years for the mixing of masterbatches involves putting all of the batch, except possibly the softeners, in the Banbury at one time and using about three times the normal pressure on the ram. High horsepower is required for a fairly short time, but the mixing cycle time is considerably reduced. High horsepower mixing is also being used for final mixing, but the results are not conclusive as yet.

A comparison was made between the use of the No. 11 Banbury equipped with a 600-hp motor operating the rotors at 40 rpm. with a floating weight cylinder 11 inches in diameter providing about 25 psi. pressure on the batch, with a high-pressure Banbury equipped with a 800- or 1000-hp. motor and a 20-inch diameter floating weight cylinder to provide 83 psi. pressure on the batch. The mixing cycle for the former for a tread masterbatch was given as six minutes and for the latter as 3-3½ minutes.

High horsepower mixing with the tougher type of compounds such as tire stocks, high tensile mechanicals, sole and heel compounds, and floor tile compounds has shown promise in the field. This method is not effective in reducing cycle time for softer compounds.

Investment costs on the Banbury alone, exclusive of motor and control, are about 25% higher for high-pressure mixing. Consideration should also be given to means of handling the short-cycle mixings most effectively by means of sheeting extruders or pelletizers after the Banbury and automatic weighing and handling equipment before the Banbury, it was said.

Mixer-Extruders

Mr. Drew discussed extruders and mixer extruders. Today's extruders will stand heavier loads and extrude more stock at lower temperatures with greater accuracy, he declared.

The five basic types of feed screws, their special features, and applications were described in some detail. It was pointed out that the maximum production of extruders was about 100 times the screw diameter, that is, 250 pounds per hour from a 2½-inch machine.

Continuous processing by extrusion is not at this moment a reality, but advances have been made in this field that may result in a successful mixer-extruder. The Mil-X-Truder by NRM takes cold compounded stock and by a combination of shearing and mixing action raises the temperature of the stock to that necessary for extrusion, producing extrusions equal to or better than those made in the conventional extruder-fed prewarmed stock.

Used in reclaiming the Mil-Strainer (Mil-X-Truder for reclaiming) takes digested stock in crumb form with 6% to 10% moisture content mixed with oils and produces reclaim that may be fed direct to the finishing mill.

For oil extension of synthetic rubber stocks an oil injection ring may be placed between the first and second sections of a Mil-X-Truder. Fifteen per cent of oil by weight has been successfully dispersed in butyl rubber in the laboratory by this method.

Mr. Drew mentioned that a development of The B. F. Goodrich Co., called the Rotomill, for which patent application has been made, has been turned over to NRM for incorporation into a compounding unit now in the final design stage.

Experiments with the Mil-X-Truder for dewatering synthetic rubber crumb and also for synthetic resin dewatering have shown that with one or more bar sections to increase mixing action and with one machine feeding into a second to approximate a machine four times the standard length, moisture content was reduced to 0.15% at the rate of 240 pounds per hour on a small machine or equivalent to 7,000 pounds per hour on a 10-inch machine.

The future compounder-extruder was visualized as a machine four to five times as long as a standard extruder, with a center main feed box and screw stuffing means to meter an exact amount of rubber along with carbon black, oils, pigments, etc., into a screw machine that would deliver into a section of a Mil-X-Truder for initial mixing. The batch would then be delivered through a valving means into a second mixing section where more compounding ingredients would be added and then into a third section of intensive mixing and on into a Rotomill section equipped with either a section die or a tubing die and slitter knife to produce a compounded stock. Finally, the compounded stock will be taken directly to an extruder for final forming into shapes or tubes or premolds.

Uniterm Index Confab on Patent Publishing

Information For Industry, Inc., Washington, D. C., publisher of the Uniterm Index, a compilation of the more than 6,000 chemical patents issued in the United States during 1955, held a conference of its subscribers at the Hotel Statler, Washington, D. C., December 5 and 6, to formulate plans for additional volumes.

According to the publisher, the Index analyzes, edits, and compiles all 1955 chemical patents in a system based on the mathematical computer principle now being used by more than 160 governmental and industrial organizations. A great reduction in the time needed for a patent search, as well as the saving of patent file space, is said to be effected.

The Information For Industry subscriber conference suggested the advisability of a five-year Uniterm Index to include the years 1950 to 1954. Such a compilation will be published at the earliest possible date at a price not to exceed $4,000, it was revealed.

Also decided were that tracings of patents would be made available to subscribers at no additional charge; that the 1955 year-end issue of the Index will contain a separate book of compounds, but packaged to insure its not being separated from the Index; that the publishers will make available six issues per year of the Index at subscribers rates; and that foreign patent availability would be investigated and a report submitted to subscribers.

Information on the Uniterm Index may be obtained from Information For Industry, Inc., 1108 16th St., N. W., Washington 6, D. C.

Ultrasonics Raises Rate of GE Insulation Manufacture

Development of a technique to speed up the process of making electrical insulation by as much as ten times through the use of ultrasonics, sound waves inaudible to the human ear, has been revealed by General Electric Co., Schenectady, N. Y.

Although the new technique may lead to significant cost reductions in treating materials used in electrical insulation, the process is so far not economically feasible on a commercial scale, according to George E. Henry, associated with GE's general engineering laboratory.

In the new impregnation technique semiporous materials such as paper and cloth are treated speedily with an insulating liquid such as varnish, resin, or asphalt, while the sound waves are beamed through the liquid.

The ultrasonic beam serves to agitate the liquid with a to-and-fro motion that changes the direction of the liquid's particles a million times a second, Mr. Henry explained. The process is either used on bulk material or on the fully assembled electrical unit, depending on which is more practical.

The conventional method of impregnating paper or cloth is to subject it to a pressure-vacuum cycle in the presence of the liquid impregnant. This method calls for applying pressure and vacuum alternately and is generally time-consuming.

The ultrasonic process is also said to be applicable to the treatment of materials for other uses, such as laminar plastics. Here bulk treatment is more effective for producing such plastics as those used for kitchen counters, Mr. Henry declared.

Give Specialty Latex Talks Before Northeast Section

The third meeting of the Elastomer & Plastics Group, Northeastern Section, ACS, was held Tuesday evening, January 17, at Science Park, Boston, Mass., with 51 members and guests present, and the worst storm of the season raging outside.

Following the usual cocktail hour and catered dinner, Chairman Charles S. Frary, Jr., Boston Woven Hose & Rubber Co., presented Ernst A. Hauser, MIT, who served as chairman of a symposium on the subject: "Specialty Latex Applications." In his introductory remarks Dr. Hauser described the first commercial use of latex in Austria and the particular part he played in this development.

Latex in Leather Field

The first speaker was Robert Shaw, Rohm & Haas Co., who spoke on "Latex Applications in the Leather Finishing Field." A description of the various types of leather in use today was first given, with an outline of the finishing materials requirements of each, including penetration, break (finish flexibility), color, surface leveling, and enhancement of natural grain.

Both water and solvent systems are used, and both may include latices. Discussing first the use of water systems, Dr. Shaw told why early latex applications in this field, using natural latex, were failures, owing to rapid aging, lack of adhesion, and emulsion stability problems.

Water-type finishes employ latices as additives to the total composition, not as a separate coating material, and in the resulting reduction of penetration into the hide they increase the filling, reduce the number of coats required, and improve adhesion, water resistance, and flexibility. These properties are especially valuable in shoe leather finishes.

The solvent-type of finish first used latex as a sealer coat, below the pigmented lacquer, owing to the gradation of leveling effect with amount of surface absorption. Acrylic esters, polymerized to a specific softness by selection of particular monomers, act as excellent levelers, with a barrier effect toward subsequently applied lacquer softener migration into the leather, while the thermoplasticity of these elastomers is utilized for production of a high gloss during smooth plating (press heating).

Today the acrylonitrile-butadiene copolymers and the acrylics are most generally used in the shoe leather finishing field; while polyvinyl alcohol and polyvinyl chloride are found to be too hard. GR-S and chloroprene rubber types give trouble with adhesion of subsequent lacquer coats, and natural rubber latex disintegrates rapidly.

Latex with Textiles

The second speaker of the evening was Neil Sherwood, B. F. Goodrich Co., who addressed the group on the subject: "Hycar Latex[1] as Applied to Textiles."

Latices are used for increasing the wear and laundering life of cotton, reducing shrinkage in wool, and binding colors in textile printing and dyeing. Warp sizing of cotton in the slasher for blue denim yarn, using latices, showed abrasion resistance after five washings for Hycar latex to be three times as high as GR-S type rubber, PVC, and polyacrylic ester latices, and five times that of the control. This means a 30-50% increase in wear of children's clothing and was accomplished without any change in the hand of the fabric. In addition, the latex binds the indigo to the yarn so that there is no transfer of color to the white filler yarns of white-back denims.

Further treatment, by padding on a nitrile latex, increases still more the resistance of the fabric to abrasion, especially if the fabric has been desized, or if the sizing is low. The crocking of naphthol and pigment dyes is largely prevented by padding with 1-3% Hycar solutions, and at the same time that the pigments are bound, the colors are darkened in shade (acetate, vat, and direct dyes) as the elastomer is dyed itself in the process. This property is used in identifying the presence of nitrile type latex on cotton; the acetate dye colors only the latex deposit.

The modification of urea-formaldehyde and melamine-formaldehyde wrinkleproofing resins (70% replacement) improves wrinkle resistance, but owing to discoloring tendencies this practice is less desirable than using polyacrylic latices.

Non-woven fabrics make the newest and fastest-growing field of use for nitrile latices in the wearing apparel and industrial fields; the latex acts as binder and eliminates weaving of upholstery-backing fabrics, with dry-cleaning resistance an additional factor in their favor.

[1]B. F. Goodrich Chemical Co., Cleveland, O.

Rubber Division Spring Meeting Plans

Plans for the spring meeting of the Division of Rubber Chemistry of the American Chemical Society to be held at the Hotel Cleveland, Cleveland, O., May 16 through 18, are beginning to take shape. The 1956 Division chairman is A. E. Juve, B. F. Goodrich Co. Research Center, Brecksville, O. Chairman of the committee on local arrangements for this Cleveland meeting is C. A. Smith, N. J. Zinc Sales Co., Cleveland.

There will be a luncheon-meeting of the 25-Year Club on May 16, with F. W. Stavely, Firestone Tire & Rubber Co., chairman for this meeting of the Club. The usual Division banquet will be held on the evening of May 17.

A. M. Neal, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., Division secretary, has set March 15 as the deadline for the receipt of abstracts of papers to be presented at this Cleveland meeting. Abstracts should be about 200 words and submitted to the secretary in triplicate. Authors in the letter of transmittal must tell the laboratory in which the work was done, who will deliver the paper, and how much time is requested for presentation. At least one of the authors, if a resident of the United States, must be a member of the ACS. Four copies of the paper are to be delivered to the secretary at the meeting.

Abstracts of the Cleveland meeting papers and further details regarding this meeting will appear in the April issue of RUBBER WORLD.

Cooke Speaks on Pigments At Ontario Rubber Section

"Colors in Rubber" was the subject of a talk given by James N. Cooke, Jr., Cooke Color & Chemical Co., before more than 100 members and guests of the Ontario Rubber Section, CIC, at Pickfair Restaurant, Toronto, Ont., Canada, January 10.

Colors used in rubber compounding must be non-bleeding and non-migrating, and must have a copper and manganese content below compatible limits, Mr. Cooke said. Allowable is an inactive manganese content up to 300 parts per million and an active copper content up to 25 parts per million. Active manganese, however, in excess of 10 parts per million will injure the compound.

Organic and inorganic pigments may be used in either the dry form or as masterbatches, he declared, with masterbatching adding 10% to color costs, a small cost compared to the indirect savings effected. This speaker cautioned that colors should be incorporated during the rubber breakdown whenever possible.

Discussing choice of pigments, he pointed out that organic pigments will result in clean, bright colors; while stable inorganic pigments will result in a duller shade of color. Red oxide was recommended as yielding excellent colors at low cost.

Mr. Cooke declared that three or four good standard medium-shade primary colors and several secondary colors would allow a manufacturer to make almost any color shade he would want. He suggested orange and purple as good secondary colors for blending with reds and blues.

He asserted that although colors do not add to the quality of a product, they certainly add to its salability, especially since the public is becoming more color conscious.

Tlargi's Christmas Party

A record 350 members and guests of The Los Angeles Rubber Group, Inc., attended the organization's annual Christmas party at the Ambassador Hotel, Los Angeles, Calif., December 16. Roy Phelan, Atlas Sponge Rubber Co., headed the arrangements committee.

Officers for the 1956 term were announced. They are: chairman, Carl S. Hoglund, R. D. Abbott Co.; associate chairman, Roy Phelan, Atlas; vice chairman, A. H. Federico, C. P. Hall Co.; treasurer, B. R. Snyder, R. T. Vanderbilt Co.; and secretary, W. M. Anderson, Gross Mfg. Co. The directors are: J. W.

(*Continued on page 700*)

NEWS of the MONTH

Washington Report and National News Summary

. . . Goodrich-Gulf bid of $11 million for Institute GR-S plant should satisfy "full, fair value" requirement, being almost twice as high as other bids. Sales contract guarantees more than half of output to small users. Percentage of total industry capacity with Institute not much more than for Goodyear, Firestone, U. S. Rubber.

. . . Legislation introduced in Congress for sale or long-term lease of alcohol-butadiene government-owned plant in Louisville, Ky.

. . . Administration drafting legislation for one-year lease of Akron Government Laboratory and/or sale by competitive bidding for June, 1956, or 1957. Defense Department studying government's synthetic rubber research program with the view of assuming costs for projects having value for military needs. National Science Foundation synthetic rubber research faces curtailment in 1958 unless new appropriations provided.

. . . Federal Trade Commission has charged three major tire manufacturers and oil companies with restraint of trade in connection with commissions paid to promote sale of national brand-name tires at filling stations. Tire companies claim practice started 25 years ago, and legality never before questioned. Confidence expressed that commission plan will be held legal and beneficial to public.

. . . A survey of wholesale price indices of the rubber and rubber products industry, compared with chemical and other industries, from 1947 through 1955 reveals much wider fluctuations. A study of raw material usage in GR-S production has been reported as possible aid to the estimating future material requirements.

. . . A National Science Foundation survey on research and development costs and personnel shows the rubber industry lagging behind about a dozen other industries in total expenditure, but figures should be presented as percentage of dollar sales to be of more practical value.

. . . Rubber Manufacturers Association estimates 1955 new rubber consumption at new record high of 1,525,248 long tons, and synthetic rubber production at record breaking 971,999 long tons.

Washington Report

Democratic Congress Gets Report of Attorney General And Disposal Commission Defending Institute Plant Sale

The Rubber Producing Facilities Disposal Commission and Attorney General Brownell last month submitted a report to Congress endorsing the proposed $11-million sale of the Institute, W. Va., GR-S synthetic rubber plant to Goodrich-Gulf Chemicals, Inc., Cleveland, O.[1]

Both agencies presented closely argued statements defending the sale as a good break for the taxpayer and of positive merit to future competition in the industry. The report was aimed at heading off a possible veto of the sale by a Democratic-led Congress attuned to the problems of small businessmen. Because Goodrich-Gulf, a joint venture of two large concerns, would find its share of the nation's synthetic rubber producing capacity greatly enlarged by acquiring Institute, there were real fears that the sale might come under attack on "monopoly" grounds.

Anti-Monopoly Arguments

The Commission and Mr. Brownell presented these arguments to dispel monopoly fears:

1. The $11-million price is "full, fair value" for this long-idle facility and is in line with prices paid for competitive GR-S plants. Thus Goodrich-Gulf would enjoy no competitive advantage over other producers and sellers of GR-S. Estimates presented to the Commission put production costs at Institute at zero to 2¢ a pound higher than at other large plants. One bidder, an experienced operator, estimated the maximum disadvantage at Institute at two-tenths of a cent a pound.

2. Reactivation of Institute will contribute a substantial addition to present tight supplies of GR-S, thus easing the supply pinch now being felt throughout the consuming industry. Non-integrated small users will share in these benefits because the sale contract drawn up by the Commission requires Goodrich-Gulf to make available, at fair market prices, a substantial portion of Institute's output to such users.

Binding contract warranties covering the first 10 years of operation require Goodrich-Gulf to give first call to small, non-integrated consumers on these quantities of GR-S from Institute: 21,000 tons when one line is in operation; 51,000 tons when two lines are in operation; and 81,000 tons

[1] RUBBER WORLD, Jan., 1956, p. 538.

when all three lines are in operation. Institute has a rated capacity of 122,000 long tons annually, comprised of three lines of equal capacity (about 41,000 tons per line).

3. While acquisition of Institute would increase Goodrich-Gulf's share of existing GR-S capacity from 12.3 to about 20% of the industry's total, this will not, by itself, put Goodrich-Gulf in a position to dominate the industry. Goodrich-Gulf, with Institute, will remain "about on a par" with Goodyear, U. S. Rubber, and Firestone. Goodrich-Gulf, furthermore, "will face active competition from the non-rubber fabricators, Shell, Phillips, and United Rubber & Chemical, the first two of whom own plants 'major' in size."

Goodrich-Gulf's ownership share in the industry will diminish proportionately as other producers expand their capacities. The Commission said announcements made over the past few months point to an overall increase in GR-S capacity to 1,107,100 tons within a few years from currently operating capacity of 856,600 tons. When all of this expansion is in place, Goodrich-Gulf's share of the total will be 19.6%. This will "not differ appreciably" from the 18.8% approved by Congress for Firestone in the first round of disposals last year. Other expansions which may come along, but which have not yet been announced, would cut further into Goodrich-Gulf's percentage of the industry total. Goodrich-Gulf, aside from a 5,000-ton increase in the capacity of its Port Neches GR-S plant, achieved through "bottleneck removal," has no other expansion plans in GR-S. In a real sense, acquisition of Institute is Goodrich-Gulf's "expansion."

Goodrich-Gulf or Standby

The Commission went to great pains to assuage fears that sale to Goodrich-Gulf poses a threat to competition for good reason. The Disposal Law was quite specific in requiring that the Commission propose a sale that will not violate anti-trust laws. The Attorney General was required to submit a finding to Congress on this very point. Last fall, when bids were first received for Institute, the Justice Department informally advised the Commission against selling to either Goodrich-Gulf or to Goodyear Synthetic Rubber Corp., because their affiliations with the rubber industry's Big Four would create anti-trust problems should they acquire Institute.

The Commission, because it could get no acceptable offer from any of the four remaining "independent" bidders, found itself with the alternative, after negotiations were completed, of selling to Goodrich-Gulf or recommending no sale at all. The Attorney General, with some reservations, ultimately agreed that competition in the industry would be served better by restoring the plant to production than by maintaining it in government "stand-by" for an "indeterminate period" (a minimum of three years).

Nevertheless Mr. Brownell felt constrained to inform Congress that he would have vetoed the sale had it been consummated between private parties, a private seller and a private buyer. But sale of an idle government plant to a private firm, he said, "cannot lessen competition on the production level, because it creates additional competition and eliminates no competitor. Perhaps of more importance, it can and should increase competition on the fabricating level."

Congress has 30 legislative days (days when it's in session) to review the proposed sale. Either House or Senate can kill the sale by adopting a resolution of disapproval by majority vote. At this writing (January 20), the sale has been before Congress nearly two weeks, and no veto resolution has been presented in either chamber. Reports have it that public hearings, at least in the Senate, are likely, but that the House Armed Services Committee is quite satisfied with the sale and will call no hearing unless a disapproval resolution comes before it.

Institute Bids—Industry Expansion Plans

Two things in the Commission's report on the Institute sale are worthy of special note: first, the array of bids, showing a great disparity between the offers of the six bidding firms, each of whom contended that its initial bid represented "full, fair value"; second, the tabulation presented by the Commission of expansion plans in the synthetic rubber industry. This is the first such published summary of contemplated expansions. The figures presented are for net GR-S capacity, excluding oil extenders used in some plants to stretch output.

GR-S Type Rubber Capacity and Planned Expansions*

Original Plant Capacity Long Tons	Plant		% First Disposal (Total Cap. 689,000)	% with Baytown (Total Cap. 733,600)	Including Institute and Current Announced Expansion to 1107.1 Thousand LT		
					LT	%	
122,000	Institute				122	11.02	Goodrich-Gulf plus Institute equals 217,000 LT or 19.6%
90,000	Goodrich-Gulf		13.1	12.3	95	8.58	
44,000	American Synthetic		6.4	6.0	44	3.96	
49,000	Copolymer		7.1	6.7	61.3	5.54	
30,000	Firestone-Akron	129,600	18.8	17.7	189.9	17.16	
99,600	Firestone-L. C.						
40,000	General Tire (new plant)				40	3.62	
15,200	Goodyear-Akron	114,800	16.6	15.6	164.6	14.86	
99,600	Goodyear-Houston						
63,000	Phillips		9.1	8.6	116.3	10.51	
89,000	Shell		12.9	12.1	†89	†8.04	
88,000	Texas-U. S.		12.8	12.0	118.8	10.74	
22,200	U. S. Rubber		3.2	3.0	22.2	2.01	
44,000	United Rubber & Chem.			6.0	44	3.96	
895,600					1,107.1	100.0	

* Source: Rubber Producing Facilities Disposal Commission—Report to Congress—Recommending Disposal of the Government-Owned Synthetic Rubber Plant at Institute, West Virginia (Public Law 336—84th Congress), January, 1956.

† Shell has announced that capacity will be "materially increased," but assigned no figures to the expansion. In the absence of a specific figure, no expansion could be reflected in the table. The effect of this expansion will be to reduce all other percentages.

They include the expansions announced by six firms to date, plus the new plant which General Tire and El Paso Natural Gas plan to erect in Odessa, Tex. As the accompanying table shows, no expansion is listed for American Synthetic Rubber Co. at Louisville, United States Rubber Co. at Naugatuck, United Rubber & Chemical Corp. at Baytown, or Shell Chemical at Los Angeles. Shell has announced that capacity at its GR-S plant will be "materially increased," but disclosed no figure. The three others have given no indication of intention to expand.

As for prices offered for Institute, the Commission gave this picture:

Goodrich-Gulf's original bid October 7 was $9 million. It was raised to $9.5 million November 21 and to $11 million December 19, which was the final day of negotiations.

Goodyear Synthetic bid $2 million October 7, never raised, and withdrew December 16.

Imperial Commodities Corp., the Dutch controlled firm which did more than any other to get Congress to re-offer Institute for sale last summer, presented an opening bid of $750,000 and stuck to it until December 19.

Edwin W. Pauley, California oilman who owns a substantial interest in Pacific Tire & Rubber Co., offered $2 million on October 7, raised to $2,837,000 on November 21, to $3,537,000 on December 1, and to $5.8 million on December 19.

Union Carbide & Carbon Corp., the betting favorite among sideline observers to win Institute, opened with $1.5 million October 7, raised to $2.7 million November 21, and stayed at that figure to the end.

United Rubber & Chemical bid $4 million at the start and withdrew November 21.

The Commission gave this history of its negotiations, which began October 25. After receiving information from all bidders on expected operating costs and capital improvements, it asked all by telephone to submit revised bids by November 21. The Commission next adopted a procedure whereby all bidders would simultaneously file with the Commission by December 19 their highest final bids, in the form of signed contracts of sale, with no further opportunity to raise the offering price. These were opened by the Commission, and the high bidder was announced to the assembled bidders as the winner of the plant.

Commission to Try to Sell Louisville Plant Once More

Legislation has entered the Congressional hoppers to authorize a second attempt at outright sale of the government-owned alcohol butadiene plant at Louisville, Ky. Rep. Edward F. Hebert (Dem., La.) last month introduced HR 8357 directing the Rubber Producing Facilities Disposal Commission to conduct a negotiated sale or long-term lease of the 60,000-ton a year plant, which is the only major unsold facility of the 51 that were built under the government's World War II synthetic rubber program.

Sale or Long Lease?

The bill establishes the same sales procedure and general terms—including a 10-year national security clause and Congressional review—utilized in previous disposals since 1953. The Louisville plant, under this bill, would be offered for competitive bid, the bidding period to be open for 30 days. This would be followed by a 60- or a 75-day negotiating period.

In the event the Commission should fail to make a satisfactory sale, it is authorized by the Hebert bill to contract a 15-year operating lease. This latter feature reportedly was incorporated by Hebert at the request of Publicker Industries, Inc., present operator of the facility under a three-year lease signed with the Disposal Commission last March.

As this was written, January 20, Sen. Earle C. Clements (Dem., Ky.) was understood to be readying a companion bill for introduction in the Senate.

Publicker Industries Interest

Publicker brought the Louisville facility out of "standby" last summer, when it put one of the three 20,000-ton processing lines into operation to supply butadiene chiefly to the nearby GR-S type rubber plant (44,000 tons) purchased a few months earlier by American Synthetic Rubber Co. More recently, a second line was restored to production, partly in anticipation of the transfer of the huge GR-S type rubber plant at Institute, W. Va., to private ownership.

Some opinion holds that with bottleneck removal and other engineering steps, the effective capacity of each unit can be raised another 5,000 to 10,000 tons. Expansions on this or some larger scale will require additional capital investment in the plant. Publicker, it is said, would be willing to undertake such expansions at the butadiene plant if it had assurance of longer-term operating authority than currently available through a three-year lease.

Publicker, which took a hand in last summer's legislative efforts to authorize a second try at selling the Institute GR-S type rubber plant, is reported to be the prime mover in this new effort to put the Louisville butadiene plant into private hands either by sale or a long-term lease. A Philadelphia firm, Publicker maintains a large processing plant in Hebert's district for converting imported molasses into industrial alcohol. The latter is the major feedstock material for the type of butadiene produced at Louisville.

Administration Begins Drafting Legislation on Synthetic Research Acording to Three NSF Recommendations

The Eisenhower Administration last month began to gear the government's synthetic rubber research program to the recommendations transmitted to the National Science Foundation in December by a Special Commission headed by New York patent attorney William H. Davis.[2]

NSF Proposals

The Davis Commission, made up of six scientists and five non-scientists, made these proposals.

1. The government rubber testing and evaluation laboratories at Akron should be offered to the University of Akron on a one-year lease, without federal operating subsidy. The lease, if accepted by the University, would begin July 1, 1956, and is unrenewable at its termination a year later. Meanwhile the Foundation should seek Congressional legislation authorizing sale of these facilities to private industry or other non-governmental institutions.

Transfer of the Akron labs under a negotiated sale procedure should take place July 1, 1957, the Commission advised. The University of Akron, with a full year's experience in operating the labs on a commercial basis, would be eligible to compete on an equal basis with others entering purchase proposals.

2. The present $1 million a year University research contracts program in synthetic rubber[3] should be terminated by July 1, 1957, and replaced by an expanded federally supported program in basic high polymer research. The 11 University grants, taken over last year by NSF from the Federal Facilities Corp., should be allowed to lapse in their present form at their scheduled expiration date, June 30, 1956.

To avoid abrupt termination of worthy research projects, the Special Commission offered these suggestions: (a) that the Defense Department and private industry closely examine the 11 projects now carried out under the NSF-financed synthetic rubber research program and take over the support of those which promise benefits in line with defense or commercial research objectives; (b) that NSF do what it can to continue support of those synthetic rubber research projects which meet the test of basic high polymer research.

3. The government "at its highest levels" should immediately consider the need of federal aid to bring the recently developed polyisoprene synthetic "natural" rubbers into commercial production.

Action on NSF Proposals

Taking them in order, here's what is being done with the Commission's three major proposals:

1. Legislation is now being drafted by NSF authorizing the General Services Administration to offer a one-year non-renewable lease of the Akron Government Laboratory to the University of Akron and to sell these facilities at the expiration of that lease. The Laboratory will be transferred to GSA's jurisdiction on June 30, 1956. At this writing (January 20) negotiations are under way with the University of Akron looking toward the contemplated lease. If the University rejects the no-subsidy leasing terms offered, it is likely that an effort will be made to speed legislative approval of a competitive bid sale with disposal effective June 30, 1956, or as soon thereafter as possible. A quick sale would avert any need of placing the labs in government standby, a costly operation even for an interim period.

2. The Defense Department is in the process of taking a close look at NSF's soon-expiring $1-million-a-year synthetic rubber research program, with the idea of picking out for continued support those projects holding out something of value in meeting military needs.

While nothing definite can be said at this early date, the most promising candidates for a Defense Department research contract are those projects aimed at finding rubbers able to withstand extremely high temperatures, such as are engendered in operating jet aircraft. About $500,000 in grants under NSF's synthetic rubber research program is for research in line with what is popularly supposed a Defense objective: developing a wholly satisfactory synthetic substitute for natural rubber. The aim is to lick the main stumbling block (rapid heat build-up) to using synthetics in heavy-duty tires.

Whether similar efforts are being made to find private industry backing for projects in the current NSF University grants program is not known. Whether they will may depend on the extent to which the rubber industry, having recently acquired the former government synthetic rubber plants, agrees with the Special Commission's opinion that the University grants program has and continues to be geared primarily to the needs of the synthetic rubber producing facilities.

As for NSF's own contribution to the support of synthetic rubber research, this much may be said. Research grants for synthetic rubber, as such, will come to an end this June 30. The only hope for the University grantees who cannot find future support elsewhere is to find a home under NSF's high-polymer research program. Only small parts of the present synthetic rubber research program will find future financing this way, and for two reasons: first, the research budget is smaller—far less than the $1 million allotted to the soon-expiring synthetic rubber program this year; second, the competition is keener—the high polymer program encompasses basic research in plastics, fibers and elastomers. For the University contractor in synthetic rubber this means fighting harder for a share in a smaller pie.

The fiscal 1957 high polymer research program cannot be taken as a guide to the funds available in the future. A good part of the money will be "carry-over funds"—income from the sale of the government's synthetic rubber plants to

[2] *Ibid.*, p. 536.
[3] *Ibid.*, Oct., 1955, p. 90.

private industry last year. This source will be shut off in 1958. It may be replaced by expanded funds in NSF's regular budget if NSF adopts the Special Commission's proposal to increase basic research in the high polymer field, and Congress provides the appropriations necessary to do this. If not, it looks like even the present modest budget for the high polymer research program will be trimmed back after next year. That would not directly affect projects authorized to start July 1, 1956, since these are two-year grants. Funds set aside for high polymer contracts this year are paid out over a two-year period. The crimp would be felt when new projects come before NSF in 1957.

To sum up NSF's contribution moneywise, to a smoother termination of the present synthetic rubber research program, the present budget for high polymer research, on the order of $300,000, will be augmented for the coming fiscal year (starting July 1, 1956) *only* by funds derived from the sale of government synthetic rubber plants. This augmented fund will be well under $1 million and will serve for two-year grants in the broad field of basic high polymer research for plastics, fibers, and elastomers, the latter including synthetic rubber. Beginning in fiscal 1958 (starting July 1, 1957), the high polymer research budget may revert again to the smaller amount available this year (fiscal 1956), or be increased if NSF and Congress get behind the Special Commission's recommendation for a stepped-up effort in basic high polymer research.

A word on the President's budget message for fiscal 1957, transmitted to Congress last month: The President requested $24.3 million for NSF's "regular activities" this coming fiscal year, compared to the $13.1 million being spent this year. But he made clear that the additional money is designed not only for individual basic research projects, but also to support "special facilities for scientific investigations and experimentation. Such facilities include university computers and nuclear research reactors, biological field stations, the first major radio astronomy center in the nation, and plans for the development of a new optical astronomy observatory."

3. The Special Commission's suggestion that the government weigh the need of Federal aid in bringing on the commercial birth of the new synthesized natural rubber substitutes has been referred to the Office of Defense Mobilization, where it is being studied by a six-agency committee, headed by ODM, preparing a report on future rubber supply and requirements as well as rubber research needs. The report will go to the White House this spring as the basis for a report on these questions which the President is due to submit to Congress by April 29.

FTC Charges Six Tire, Oil Companies with Restraint Of "TBA" Trade; Firms Declare Tie-ins Benefit Public

The Federal Trade Commission filed formal charges in mid-January against three major tire manufacturers and three large oil companies, stemming from the FTC's long-standing investigation of so-called "override" commissions paid to promote sale of certain national brand-name tires, batteries, and accessories at the corner filling station.

The FTC charges of illegally restraining competition in the sale of "TBA" items were made in three virtually identical complaints under the FTC anti-trust act, one coupling The B. F. Goodrich Co. and The Texas Co.; a second, Goodyear Tire & Rubber Co. and Altantic Refining Co.; the third, Firestone Tire & Rubber Co. and Shell Oil Co.

Buying Influence and Extra Commissions

The complaints allege that the oil companies contract to influence unduly their "controlled" service stations and distributors to buy tires, batteries, and accessories ("TBA") sold by these three tire manufacturers. In return, the complaints state, the oil companies receive from the tire companies "overriding" commissions on all net sales.

These commissions, in effect special price discounts, amount to millions of dollars annually, FTC said. They run from 5% to 10% of net sales and are offered in return for "influence and aid" in promoting sales in this "large and increasingly important market."

The respondents were given until mid-March to answer the complaints. Hearings before an FTC examiner are scheduled at Washington, D. C., March 20 (Firestone-Shell); March 21 (Goodrich-Texas); March 22 (Goodyear-Atlantic).

The FTC complaints gave these dollar figures on sales and "override" payments made by the tire companies to the oil companies from 1951 to 1953:

Goodrich to Texas: sales, $8,868,751; "override," $700,000 (1951); sales, $13 million; "override," $1.1 million 1952).

Firestone to Atlantic: sales, $3,809,843; "override," $354,354 (1952); sales, $4,796,-304; "override," $446,268 (1953). Firestone to Texas: sales, $26,973,539; "override," $2,286,632 (1952); sales, $31,248,557; "override," $2,723, 890 (1953).

Also, Firestone to Shell: sales, $11,699,-347; "override," $1,091,490 (1952); sales, $14,514,485; "override," $1,360,312 (1953).

Goodyear to Shell: sales, $11,857,287; "override," $1,091,385 (1951); sales, $16,-595,761; "override," $1,523,122 (1952). Goodyear to Atlantic: sales, $2,445,808; "override," $239,250 (1951); sales, $4,175,-890; "override," $411,743 (1952).

The complaints charge that by use of the commission "override" payments Goodrich was enabled to increase its sales to Texas and five other oil companies from $5.5 million in 1946 to more than $16.5 million in 1952. A similar contention was made in the complaints filed against the two other tire companies.

According to the complaints, service stations and distributors, "ostensibly operated as independent businesses," actually are under the control of the oil producers. The service stations and distributors, FTC said, "receive no part of the commissions" paid by the tire firms to the oil companies. Neither have they authorized these arrangements, FTC added.

The effect of these practices, the complaints charge, is to foreclose competitors of the above-named tire manufacturers from the service-station markets involved; deprive station operators and distributors of a freedom of choice in deciding which "TBA" items to carry; and to deprive the consuming public of the benefits of free competition in "TBA" items.

Tire Company Replies

The following statement was issued on January 13 by the Goodyear company with reference to FTC's complaint attacking the sales commission plan:

"Until the text of the complaint is received, any comment will necessarily have to be in general terms. However, the company is confident that the sales commission plan eventually will be held not only legal, but beneficial to the public and to the thousands of independent merchants which it serves.

"The tire industry long ago recognized that the network of service stations, created in response to the demand of the motoring public, offered ready-made distribution for the tires, batteries, and automotive accessories which are natural companions to the petroleum products already handled in those stations.

"The sales commission plan, along with other methods of selling through such stations, has been in open operation for many years. This is believed to be the first attempt seriously to challenge its legality. Goodyear is confident that, when the facts have been fully developed in the hearings which are yet to be held, it will be made clear that the sales commission plan is not only legally sound, but economically desirable in the public interest, and is a method of competition consistent with the free enterprise system."

The B. F. Goodrich Co. stated at about the same time that it was surprised to learn that FTC had filed a complaint challenging the legality of payment of a commission to a petroleum company for sales services.

Payment of such commissions has been openly and widely practiced in the tire industry for more than 20 years. The complaint is inconsistent with the position of FTC in an earlier case involving another tire company. We shall vigorously contest the complaint, the Goodrich company declared.

Firestone Tire & Rubber Co. pointed out that the commission plan of marketing tires, batteries, and accessories started about 25 years ago and has been widely and openly used by a number of tire manufacturers and oil companies.

Firestone sees the program as promoting competition, helping thousands of small independent service stations, and being in the public interest.

"The plan is the same today as it has been for many years," the company added. "It has been investigated by the government a number of times and never before challenged."

After all witnesses have testified at public hearings, Firestone is confident that it will become clear that the sales commission plan is "legally and economically sound and in the public interest."

BLS Price Indices, 1947-55; GR-S Raw Material Use, 1954

Items of interest noted in the December, 1955, issue of the United States Department of Commerce publication "Industry Report - Chemical and Rubber," were a survey of trends since 1947 of what was called "Wholesale Price Indexes" for the rubber industry compared witth those for the chemical and allied products industry and all products other than farm and food, and some information on consumption of the principal raw materials used for the production of GR-S in the government plants in 1954.

Price Indices

The wholesale price index (1947-49=100) for the rubber and rubber products industry appears likely to average about 143 for the year 1955, far in excess of the probable level of 117 for "all products other than farm and food," it was said. The wholesale price index prepared by the Bureau of Labor Statistics for the rubber industry is made up of three parts, natural, synthetic, and reclaimed rubber prices, the prices of tires and tubes, and the prices of other rubber products. All of these three prices are average for the rubber industry figure.

A large factor in this sharp rise for the rubber industry was the price of natural rubber, which in the first 10 months of 1955 averaged 87% higher than that in the 1947-49 base period. Also, synthetic and reclaimed rubber prices were roughly one-fourth higher than the level of the base period. This increase in raw material prices, which substantially colors the group total, along witth important wage advances, is also reflected in the prices for finished rubber goods. Average weekly earnings of production workers in the rubber products industry have increased more than 50% over those of the base period.

Tire and tube prices advanced more sharply than prices for other rubber products. The cost of manufacture and, hence, the selling price of tires are heavily dependent upon the price of the rubber raw materials. Traditionally, large changes in such material costs tend to be reflected quickly in tire prices; while manufacturers of other rubber products, where the proportion of rubber to total materials is considerably less than for tires, operate under a condition where the relationship between rubber raw material prices and other material prices does not require so much increase in the price of the finished products.

Table 1 shows the wholesale price indices for three categories: all products other than farm and food, chemical and allied products, and rubber and rubber products, the last broken down into its three component parts, for the years 1947 through 1955 (10 months).

GR-S Raw Materials

Based on the assumption that a study of the materials used in the production of GR-S during 1954 may prove useful in estimating material requirements for future production of this-type rubber, the tables reproduced from the above-mentioned Commerce Department publication show a breakdown of the materials used for that year. It was pointed out in this connection that all chemicals used do not become a part of the finished rubber; therefore considerably more than a ton of materials is used in producing one ton of rubber.

Among the wide variety of other chemicals used in the production of GR-S type rubber, three major groups were stabilizers, processing oil, and polymerization emulsifiers, the latter including among others, sodium and potassium soaps, rosin and oleic acid. A table summarizing the consumption of these groups of materials in GR-S in 1954, as calculated from standard-usage tables, will be found in the "Statistics of the Rubber Industry" department of this issue, page 732.

TABLE 1. WHOLESALE PRICE INDICES—1947-1955

	1947	1948	1949	1950	1951	1952	1953	1954	1955
All products other than farm and food	95.3	103.4	101.3	105.0	115.9	113.2	114.0	114.5	116.6
Chemical and allied products	101.4	103.8	94.8	96.3	110.0	104.5	105.7	107.0	106.6
Rubber and rubber products	99.0	102.1	98.9	120.5	148.0	134.0	125.0	126.9	142.4
Natural, synthetic, reclaimed rubber	103.0	103.4	93.6	157.3	215.1	157.8	121.6	123.1	154.6
Tires and tubes	99.4	101.8	98.8	113.6	133.9	129.8	127.2	130.6	143.5
Other rubber products	96.3	101.8	101.9	109.9	130.9	126.7	123.8	124.1	133.5

Note: Compiled from data supplied by the Bureau of Labor Statistics, Department of Labor. 1955 figures based on data for 10 months.

TABLE 2. BUTADIENE AND STYRENE USED IN 1954 GR-S PRODUCTION

Type	Production		Monomer Used (Long Tons)		BD/Sty Ratio—%	
	Long Tons	% of Total	Butadiene	Styrene	Butadiene	Styrene
Dry Rubber						
Hot	104,797	22.4	73,198	22,901	76.2	23.8
Black	4,197	0.9	2,932	900	76.5	23.5
Cold	122,464	26.2	85,255	26,096	76.6	23.4
Black	32,133	6.9	22,246	6,835	79.2	20.8
Oil	141,622	30.2	73,089	22,450	76.5	23.5
Black	16,844	3.6	9,206	2,829	76.5	23.5
Total dry	422,057	90.2	265,926	82,011	76.4	23.6
Latex						
Hot	26,398	5.7	16,619	7,934	67.7	32.3
Cold	19,375	4.1	14,147	3,556	79.9	20.1
Total latex	45,773	9.8	30,766	11,490	72.8	27.2
Total GR-S	467,830	100.0	296,692	93,501	76.0	24.0

NSF on Research Costs

The most recent survey on the cost of research and development in American industry was released by the National Science Foundation, Washington D. C., early in January. Entitled "Science and Engineering in American Industry—Preliminary Report on Survey of Research and Development Costs and Personnel in 1953-1954," this report emphasizes that research and development in the natural sciences and engineering performed by private industry had an estimated cost of about $3.7 billion in 1953. This represents about two-thirds of the total cost of research and development in the United States for that year, since the cost of all such research including that done by private industry, educational institutions, government agencies, etc., is estimated at more than $5 billion.

More than one-third of the research and development (RD) work conducted by private industry was done for the Federal Government, on either research and development or procurement contracts.

About 554,000 scientists and engineers were employed in research and development and other types of activities in the surveyed industries in January, 1954. Scientists and engineers engaged only in research and development amounted to 157,300, or nearly 30% of the total number in all types of activities.

Chemicals Lead; Rubber Lags

Two industries, electrical equipment and aircraft and parts, far exceed all others in the scale of their research and development activities, with the chemical industry in fourth position. Of the industries or industry groups surveyed, the rubber industry occupied the twelfth position with an expenditure in 1953 of $53.6 million. The electrical equipment industry spent $778.3 million; the aircraft and parts industry, $758 million; and the chemical industry, $361.1 million during the same period.

For private industry as a whole, the cost of basic research performed in 1953 is estimated at slightly under $150 million, which figure represents only 4% of the estimated total RD cost of $3.7 billion. The chemical industry far excedes all others in the magnitude of its basic research programs, with $38 million spent; Thirteenth in the list, the rubber industry expenditures for the basic research in 1953 amounted to only $3.1 million.

Employment by Types

Of the 157,300 scientists and engineers employed by private industry in research and development work only, 105,100 of these are engineers, and 26,800 are chemists. The chemical industry employs 11,700 of these chemists and 5,500 of the en-

gineers; while the rubber industry employs 1,500 chemists and 2,100 engineers.

Interesting to note also is the fact that of the 553,800 total scientists and engineers employed for all purposes by private industry, the chemical industry employs 23,400 chemists and 26,000 engineers while the rubber industry employs 2,400 chemists and 4,600 engineers.

It was also somewhat surprising that when industries are ranked according to the proportion of their engineering staff assigned to research and development activities, although aircraft and electrical equipment once again are the leading industries, the proportion of engineers doing such work in the rubber industry is almost as high, about 45%, compared to 55% and 48%, respectively, in the aircraft and electrical equipment industries.

The largest group of chemists were, of course, working in the chemical industry. Of this group, approximately half (11,700 out of 23,400) were engaged in research and development; while in the rubber industry 62.5% (1,500 out of 2,400) were doing research and development work.

Industry News

Record Rubber Consumption Reported by RMA for '55

According to the regular monthly report of The Rubber Manufacturers Association, Inc., of January 24, new rubber consumption for the year 1955 amounted to 1,525,248 long tons, the highest consumption figure in the history of the rubber industry. This figure represents an increase of 23.7% over the 1954 consumption of 1,233,012 long tons and is 14% higher than the last peak consumption year of 1953, when 1,338,309 long tons were consumed.

Consumption for the month of December, 1955, was 124,736 long tons, and although this was 7.5% below the 134,769 long tons consumed in November, 1955, it was the highest December consumption in comparison with any previous year.

Production of synthetic rubber in December was 90,273 long tons, compared with the all-time record high production month of November, when 91,281 long tons were produced. For the year 1955, synthetic rubber production in the United States reached a record-breaking 971,999 long tons, as compared with 622,852 long tons produced in 1954.

Consumption of all types of synthetic rubber amounted to 75,962 long tons in December, compared with 81,934 long tons in November. For the year 1955, synthetic rubber consumption totaled 892,785 long tons, compared with the 1954 figure of 636,727 long tons. The ratio of synthetic to total new rubber consumed was 60.9% in December.

Natural rubber consumption during December amounted to 48,774 long tons, compared with 52,835 long tons used in November. For the year 1955, natural rubber consumption reached 632,463 long tons, contrasted with the 596,285 long tons that were consumed in 1954.

Reclaimed rubber consumed in December was estimated at 25,235 long tons, in contrast to the 27,393 long tons used in November. For the year 1955, consumption of reclaimed rubber amounted to 315,665 long tons; while only 249,049 long tons were used in 1954.

Dimethyl Silicones Reduced

Dow Corning Corp., Midland, Mich., has reduced by 7½% the price of its dimethyl silicone fluids and emulsions. The cut reflects the increased production of the materials brought about by the completion of the final unit in a $16,000,000 plant expansion program, Dow says.

Dimethyl silicones are used extensively by tire manufacturers as mold release agents. They are also employed as a polishing agent in car and furniture polishes.

Dow Corning 200 Fluid is now being offered at $3.14 a pound; while the price of the silicone Mold Release Emulsions has been reduced to $1.26. When first introduced by Dow Corning, the materials were sold at $6.80 and $2.60 a pound, respectively.

New Diamond Divisions

Diamond Alkali Co., Cleveland, O., has created two additional autonomous units, the electro chemicals division and the soda products division, completing its divisionalization of management responsibility and administrative functions first begun in January, 1953, it was announced by Raymond F. Evans, chairman and chief executive officer.

The operations of all of the company's 15 plants are now said to be covered. The autonomous divisions previously formed were the plastics; chromium chemicals; silicate, detergent, calcium; chlorinated products; and cement and coke divisions.

Named general manager of the electro chemicals division is Frank Chrencik, formerly works manager of the Deer Park Plant at Houston, Tex. Appointed general manager of the soda products division is Henry B. Clark, formerly manager of the company's New York-New England branch sales office, a position now to be held by W. B. Beeson, Jr., chlorinated solvents product sales manager.

Plans New Kralastic Plant

A $5-million Kralastic plant is being built on a newly acquired 150-acre tract of land in the Scott's Bluff region of Baton Rouge, La., by Naugatuck Chemical Division of United States Rubber Co., New York, N. Y.

According to a company official, when the plant is completed in July of 1957 and full-scale operations begin, the firm's production capacity of Kralastic will be more than doubled.

Kralastic is a copolymer based on styrene, butadiene, and acrylonitrile and is used for the manufacture of pipe, automotive parts, and such industrial products as textile bobbins and business machine housings.

BFG Tire Plant Expanding

A $4,000,000 expansion of its Miami, Okla., tire plant has been announced by The B. F. Goodrich Co., Akron, O. The new facilities will consist of buildings, utilities, and equipment. The plant, one of Goodrich's largest, now employs more than 1,500 persons.

According to J. E. Gulick, vice president of the company's tire and equipment division, and Walter E. Head, Miami plant manager, the expansion will substantially increase Goodrich's capacity for large off-the-road tires and will provide facilities for manufacturing off-the-road tires in sizes not presently made.

The Miami plant will also produce a complete line of off-the-road tubeless tires for new wide-base rims.

Tire production was begun at the plant in February, 1945.

Steel Latex Unload Pipe

Latex & Rubber, Inc., Baltimore, Md., is installing a stainless-steel ship-unloading line to augment its latex handling facilities, the company reveals. The six-inch-diameter steel pipe is thought to be the only one of its kind in the country used for this purpose.

The pipeline connects the ship discharge pump with the depot's underground reinforced concrete storage tanks. This pipeline was designed with a minimum of turbulence-creating short bends and is expected to increase greatly the discharge rate of latex.

Stainless steel was chosen as a material, according to the company, because of its corrosion resistance, easy cleanability, low maintenance care, and negligible effect on latex odor and stability. Most latex-discharging pipelines are made of plastic or glass-lined iron.

Electrothermal heating tape wound around a metal pipe with double curvature

Electrothermal Tape Used

Electrothermal tape, a knitted glass-yarn tape for heating laboratory appliances, is now being used to heat such industrial equipment as pipes, valves, gas cylinders, spray guns, and injection molding machines, according to Arthur S. LaPine & Co., Chicago, Ill., manufacturer of the tape.

The heating tape is generally suitable for operation at controlled temperatures up to 450° C., with higher surface loadings also available, the company says. The tape is made in widths of ½, 1, 2, and 3½ inches, and in lengths of 2, 4, 6, and 8 feet.

The Electrothermal tape does not buckle and can be stretched or squeezed to fit on the equipment being heated, with frequent repositioning without rewinding possible, the company declares. Insulation is on both sides to minimize heat loss to atmosphere.

Publishing AEC Reports

Reprints of the Atomic Energy Commission's research reports, published as a separate section of "U. S. Government Research Reports," issued monthly by the Office of Technical Services, United States Department of Commerce, Washington 25, D. C., are being made separately available at 10¢ a copy, starting with the November, 1955, issue.

According to the OTS, release of these reports is part of a continuing arrangement with the AEC whereby non-classified AEC reports of industrial significance are being made public as promptly as possible. The reports will cover such wide-ranging fields as chemistry, geology, metallurgy, mineralogy, ceramics, instrumentation, physics, and reactor technology.

"U. S. Government Research Reports," which, in addition to the AEC reports, carries research reports released by the Army, Navy, Air Force and some civilian agencies, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at $6 a year; $9 for foreign subscribers.

See Carbon Black Record

A record United States carbon black production figure of more than 1,724,000,000 pounds is almost a certainty for 1955, according to United Carbon Co., Inc., Charleston, W. Va.

This estimate is based on an actual output of 1,293,260,000 pounds in the first nine months of 1955, or an average of 143,695,000 pounds a month. Applying this average figure to the final three months of the year, the year's total would come to 1,724,345,000 pounds, considerably above the 1,677,000,000 produced in the record-year of 1951, and 20% higher than the 1,400,000,000 pounds turned out during 1954.

Actually, United Carbon expects the 1955 figure to be even higher than 1,724,345,000 pounds, since a production upsurge has been noted the past few months.

New Dominion Branch

Dominion Rubber Co., Ltd., has opened a new building in Toronto, Ont., Canada, to house all the sales and warehousing activities of its central division. Occupying more than 70,000 square feet of floor space, the building also has a 5,600-square-foot recapping plant.

The warehouse, said to incorporate the most modern structural features, has an inventory of tires, footwear, sponge rubber products, plastics goods, and mechanical items. A normal stock of 8,000-10,000 tires and about 100,000 pairs of footwear is kept on hand.

Equipment maintained in the recapping plant includes six Heintz passenger retreading molds, seven Heintz truck retreading molds, two C.V.E. truck vulcanizing molds, and two C.V.E. passenger vulcanizing molds. Daily capacity is said to be 30 truck tires and 95 passenger tires.

Cyanamid TiO_2 Plant Open

More than 400 people attended the dedication ceremonies and luncheon for the opening of American Cyanamid Co.'s new titanium dioxide plant at Savannah, Ga., the company reveals. The $15,000,000 facility is built on a 1,600-acre tract of land and is Cyanamid's forty-ninth production unit and its twentieth in the South.

Principal speakers at the ceremonies were K. C. Towe, company president, and S. Marvin Griffin, Governor of Georgia.

Titanium dioxide is a white pigment used in the rubber, paint, and paper industries. It is a coloring agent for such rubber goods as white-wall tires and golf balls.

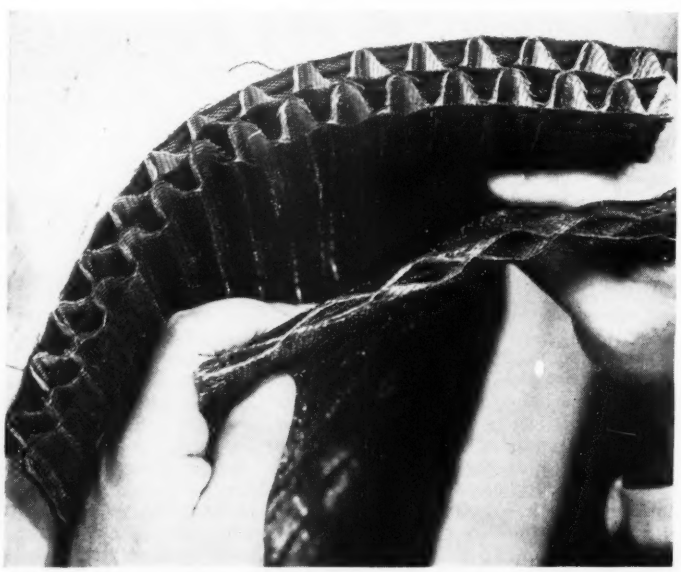
Introduce Puffed Fabric

A new line of puffed automotive and furniture upholstery fabrics has been introduced by United States Rubber Co., textile division, New York, N. Y. Called Trilok, the material is available in a great variety of fibers, colors, and patterns and because of its three-dimensional form provides air circulation between seat and sitter, as well as a mild cushioning effect.

The fabric is woven on a regular loom, but striated with polyethylene yarn. When immersed into boiling water, the polyethylene shrinks by as much as 55%, puffing the material. The slightly elastomeric polyethylene yarn imparts some resiliency to the fabric, giving it such additional advantages as freedom from wrinkles and simplifying its fitting over seats, the company says.

Besides automotive and furniture upholstery, Trilok is expected to find application as draperies, bedspreads, and carpeting.

It is currently being made at U. S. Rubber's Winnsboro, S. C., mills under a patent secured by the firm.



A new type of fabric called Trilok, a development of U. S. Rubber, which becomes three-dimensional when dipped into boiling water, is shown, upper piece, after immersion. The fabric below has not been dipped

George A. Fowles

BFG's Fowles to BDSA

George A. Fowles, sales manager of plastic materials for B. F. Goodrich Chemical Co., Cleveland, O., has accepted a temporary assignment with the United States Department of Commerce as director of its Chemical & Rubber Division, Business & Defense Services Administration, Washington, D. C.

Mr. Fowles, who was graduated from Massachusetts Institute of Technology in 1934, began his career with Anaconda Wire & Cable Co. as assistant to the chief engineer of its Pawtucket, R. I., plant, where he helped develop rubber electrical insulation and investigated the use of polyvinyl chloride as an insulating material.

He later joined The B. F. Goodrich Co. in its sales organization, subsequently becoming manager of wire and cable materials for the firm. During World War II he worked on Signal Corps, Bureau of Ships, and Air Corps committees in expediting new defense applications for polyvinyl chloride resins. Fowles acquired his present position in 1945.

Robert F. Dettlebach will assume the duties of sales manager of plastic materials until Mr. Fowles concludes his service with BDSA.

Form Sawyer-Tower, Inc.

Three Massachusetts manufacturers of rainwear and protective clothing, each more than 115 years old, have combined to form Sawyer-Tower, Inc., Cambridge, Mass. They are H. M. Sawyer & Son Co., Cambridge and Watertown; J. F. Carter Co., Beverly; and A. J. Tower Co., Boston.

This merger was brought about to achieve increased efficiency of production, research and development, and distribution. Each firm will operate as an independent division of the new company.

According to Charles L. Foote, president of Sawyer & Son, who has been designated president of the new organization, the 1955 sales records of each of the component firms have been the best in their peacetime histories.

Consider New Nylon Plant

Construction of a heavy denier nylon plant at Richmond, Va., capable of producing 35,000,000 pounds annually is being considered by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The company currently makes cellophane and rayon at the Richmond site.

The heavy denier nylon, known as 840 denier, is primarily used in the rubber industry for the manufacture of tire cord and other industrial products. Du Pont now makes this nylon at its Seaford, Del., and Chattanooga, Tenn., plants.

Construction funds for the proposed Richmond facility have not yet been authorized, du Pont points outs, and it will be several months before results of the study now going on will be known.

Stalwart Names Kravetz

J. K. Kravetz has been named chief chemist for The Stalwart Rubber Co., Bedford, O., succeeding Ralph H. Tyrell, who has retired after 23 years with the company. Mr. Kravetz will also direct factory operations at the Bedford plant, together with R. R. Long and A. V. Volpe, and will be general manager of the firm's Jasper Rubber Division, Jasper, Ga.

H. W. Osborn is president, chairman of the board, and treasurer of the company. Other officers include A. W. MacAlonan, vice president and director of sales; E. H. Osborn, vice president and director of purchasing and personnel; W. E. Farrington, vice president; F. K. Byers, Jr., secretary; W. P. Lindauer, assistant secretary; and Mrs. Alice C. Weisenbach, assistant treasurer.

W. E. Glancy Retires

Warren E. Glancy, for the past ten years manager of development for Hood Rubber Co. Division of The B. F. Goodrich Co., Watertown, Mass., has retired. He joined Hood in 1914 and did technical work relating to tires, footwear, and industrial products.

He holds membership in the American Chemical Society, the American Association for the Advancement of Science, and the American Society for Testing Materials. He is the author of several technical papers relating to hard rubber and the testing and manufacture of rubber footwear.

Reclaim Safety Meeting

The executive committee of the Rubber Reclaimers Association met jointly with the reclaimed rubber committee of the Rubber Section of the National Safety Council at the Hotel Carter, Cleveland, O., October 25, for the purpose of discussing methods to promote safety within the reclaim industry. Among those in attendance were C. G. Travers, U. S. Rubber Reclaiming Co.; P. J. Dasher, Dasher Rubber & Chemical Co., C. R. Shaffer, Xylos Rubber Co.; M. R. Batche, Firestone Tire & Rubber Co.; A. R. Pomeroy, Ohio Rubber Co.; F. Traflet, Pequanoc Rubber Co.; and R. Casey, United States Rubber Co.

According to the National Safety Council, the following recommendations were considered:

That the Reclaimers Association use the facilities of the existing committee on reclaim rubber in the Rubber Section of the NSC, which would be enlarged to include membership from all reclaim makers.

That this enlarged committee meet with the Rubber Section of the National Safety Council Congress in Chicago each year, in addition to one other possible meeting.

That the chairman of the reclaimers' committee meet at least once a year with the executive committee of the Rubber Reclaimers Association and report upon the activities of the group.

That the chairman of the rubber reclaiming safety committee be a member of the industry.

Columbia-Southern Lab

A $1,000,000 research and development building is being planned by Columbia-Southern Chemical Corp., Pittsburgh, Pa., as an adjunct to its Barberton, O., chemical manufacturing plant, according to Joseph A. Neubauer, vice president and technical director of the company.

The three-story building will contain about 40,000 square feet of floor space and will include a library, a conference room, and offices, in addition to laboratories. Construction is scheduled to start immediately.

Laboratory facilities will include advanced X-ray diffraction equipment, emission, infrared, and ultra-violet spectrographic equipment, electron microscopes, and radioactive materials.

Another research laboratory unit is nearing completion at the firm's Natrium, W. Va., plant.

Architect's drawing of new Columbia-Southern research laboratory building

R. P. Dinsmore, left, gives best wishes to retiring chief compounder Frank J. Dugan, who holds a sheaf of laudatory letters from his associates around the world

Dugan of Goodyear Retires

Frank J. Dugan, chief compounder for The Goodyear Tire & Rubber Co., Akron, O., has retired after 39 years of continuous service with the company. He was honored at an informal gathering of his associates and company executives, including R. P. Dinsmore, Goodyear vice president in charge of research.

Dr. Dinsmore, spokesman for the group, reviewed Mr. Dugan's record with the company and lauded his contributions to its development. The retiring authority on rubber compounding was presented with a gift.

Mr. Dugan was graduated from Rensselaer Polytechnic Institute as a chemist and five years later joined Goodyear as a chemical laboratory assistant. He was named chief compounder in 1943.

During World War II, Mr. Dugan was chairman of the Government's Synthetic Tire Committee, served on the tire committee of the War Production Board, and was also on the committee on Conservation of Natural Rubber.

He is a member of the American Chemical Society and the Akron Rubber Group.

Forms Silicone Division

Union Carbide & Carbon Corp., New York, N. Y., has formed a silicones division to assume responsibility for the development, manufacture, and sales of silicone products formerly held by a company subsidiary, Linde Air Products Co.

In making the announcement Morse G. Dial, Union Carbide president, said that the formation of the new division reflects the expansion of the firm's activities in the field of silicones. The company's silicones, formerly marketed under the Linde trade mark, will now be called Union Carbide Silicones.

William B. Humes, vice president of Union Carbide Canada, Ltd., has been named president of the new division, and T. J. Coleman, formerly general manager of the Linde silicones department, has been appointed general manager.

Mr. Dial also revealed that a $1-million expansion program is planned for Union Carbide's new silicone plant at Long Reach, W. Va. Reactor capacity will be increased, and additional equipment for the compounding of silicone rubbers will be installed.

Production at the Tonawanda, N. Y., plant will also continue.

Kolthoff Division Head

I. M. Kolthoff, head of the department of analytical chemistry of the University of Minnesota and one of the world's foremost analytical chemists, particularly noted for his fundamental research on the emulsion polymerization process used in synthetic rubber production, has been elected chairman of the American Chemical Society's Division of Analytical Chemistry. He succeeds William G. Batt, assistant director of the Biochemical Research Foundation of Franklin Institute. Others elected by the Division were R. P. Chapman, American Cyanamid Co., Stamford, Conn., chairman-elect; William W. Brandt, Purdue University, secretary-treasurer; B. L. Clarke, Merck & Co., Inc., Rahway, N. J., divisional representative to the ACS national council; and Kenneth G. Stone, Jr., Michigan State College, alternate divisional representative.

Escambia Plans PVC Plant

Escambia Bay Chemical Corp., Cambridge, Mass., has awarded a contract to Blaw-Knox Co. for the construction of a 30,000,000-pound-a-year polyvinyl chloride resin plant near Pensacola, Fla., according to David J. Stark, Escambia vice president and plant manager. The plant, expected to be completed in late 1956, will provide a complete line of suspension-type, easy-processing PVC resins for electrical, sheeting, extrusion, and film uses.

Named plant supervisor is Joseph Gafford, formerly with The B. F. Goodrich Chemical Co. Walter W. Peacock, Jr., formerly with the Naugatuck Chemical Division of United States Rubber Co., has been appointed sales manager.

Escambia is currently completing a $23,000,000 plant near Pensacola for the production of ammonia and other nitrogen compounds.

The company is jointly owned by United Gas Corp., Electric Bond & Share Co., and National Research Corp.

Wins Footwear Contract

Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., has been awarded a contract by the Philadelphia Quartermaster Depot to supply the U. S. Army with 86,004 pairs of rubber overshoes, valued at $309,614.

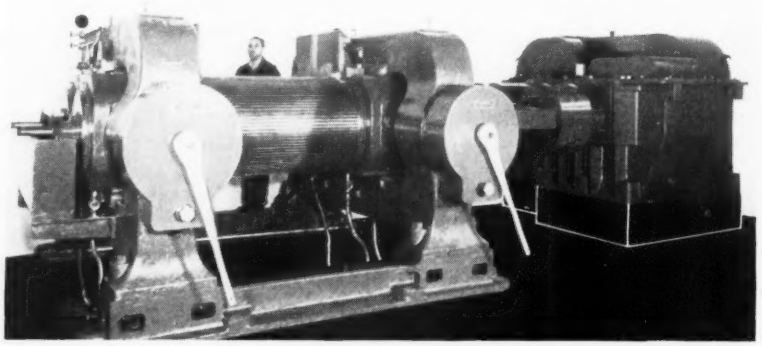
Farrel-Birmingham Cracker Rubber Industry's Largest

What is called the largest and most powerful tire cracker ever built for the rubber industry has been made by Farrel-Birmingham Co., Inc., Ansonia, Conn. The giant machine is equipped with 32- by 54-inch rolls and is capable of grinding up whole tires to ½-inch mesh at the rate of 10,000 pounds an hour, stripping the bead from the rubber at the same time.

All gearing of the cracker is enclosed in a separate 700-hp. Uni-drive connected to the rolls by universal spindles. This construction, the company says, provides smooth and efficient transmission of power under the heaviest torque load. Drive and connecting gears are of the continuous-tooth herringbone type. A heavy flexible coupling is used to connect the Uni-drive high-speed shaft to the electric drive motor.

The cracker has a flood lubrication system with oil tank, pump, and filter. Other design features include a shear-pin-type breaking member and pullback between journal box and adjusting screw, ratchet roll-opening adjustment through worm and worm wheels, and an electrical safety throwout.

Housing and cap of the cracker are cast integrally of high-strength metal, making an extremely strong, one-piece structure, according to the company. Rolls are removed endwise so as not to disturb any feed arrangement above the cracker when the rolls are taken out for regrooving.



Farrel-Birmingham 32- by 54-inch tire cracker

Brands Forms Own Firm

George B. Brands, vice president and treasurer of R. R. Olin Laboratories, Inc., has resigned to form his own technological consulting office in Akron, O., specializing in all phases of rubber manufacturing and testing, including research and development and design of manufacturing and testing equipment. Prior to the Olin connection, Mr. Brands had been with the rubber section of Armstrong Cork Co. He holds membership in the Akron and Philadelphia rubber groups and the Akron Section and the Division of Rubber Chemistry of the American Chemical Society.

Naugatuck's Casey Retires

Robert E. (Bob) Casey, marketing coordinator for the Naugatuck Chemical Division, United States Rubber Co., retired on January 5, after 33 years with the company. Bob Casey joined Naugatuck Chemical as a chemist in 1922, following graduation from the University of Vermont and after a brief period of teaching and employment with another chemical firm.

In 1926 he was assigned to the chemical division's sales force and held sales posts for the balance of his career. In 1936 he was appointed sales manager of rubber chemicals, reclaimed rubber, and labels. He was named general sales manager in 1941 and held that post until 1955, when he became marketing coordinator for the division.

Bob Casey was honored with a retirement party at the Chemists Club in New York, N. Y., on the date of his retirement at which about 30 of his business associates and friends in the rubber chemicals industry were present. This party was arranged by Bruce Silver, N. J. Zinc Sales Co., and Allyn Brandt, B. F. Goodrich Chemical Co.

The accompanying photograph shows Bruce Silver presenting Bob Casey with a certificate prepared for the occasion and signed by those attending the dinner party.

Harold E. Weigold

Hammerl

Curtis L. Moody

Goodyear Tubeless Weighs 2,000 Pounds

A 2,000-pound tubeless tire is being manufactured for giant earthmoving vehicles by The Goodyear Tire & Rubber Co., Akron, O., the company reveals, claiming to be the first in the industry to make available a complete line of tubeless tires for trucks and earthmovers. The huge tire, called Sure-Grip Lug, has an all-nylon cord construction and is designed for the company's new tubeless wide-base earthmover rim. Size is 33.5-33, 38-ply rating.

New Stauffer Executives

George L. Bond and E. S. Rothrock have been elected directors and vice presidents of Stauffer Chemical Co., New York, N. Y. Mr. Rothrock has also been named general manager of the company's Consolidated Chemical Industries Division, Houston, Tex.

New U. S. Rubber Section Will Plan Tire Production

A new production planning department has been formed by the tire division of United States Rubber Co., New York, N. Y., to coordinate more closely tire production scheduling and customer service, R. E. Behrman, company production manager, has revealed.

The new department, to have its headquarters in Detroit, Mich., where the largest of the tire division's five plants is located, was necessitated by the great increase in sizes and types of tires and the introduction of colored tires and special styles. Mr. Behrman explained.

Curtis L. Moody, factory manager of the Detroit tire plant, has been named production planning manager of the new department, and Hugo W. Weisse has been appointed his assistant.

Replacing Mr. Moody as Detroit factory manager is Harold E. Weigold, formerly factory manager of U. S. Rubber's Chicopee Falls, Mass., tire plant. Succeeding him in Chicopee Falls is S. Edward Harrison.

Bruce Silver, left, presenting certificate of greetings to Bob Casey on the occasion of the latter's retirement party, January 5

Reveal Teleradio Financing

Thomas F. O'Neil, board chairman of RKO Teleradio, Inc., declared in a press interview January 5 that the financial statements of his recently organized motion picture and television producing and distributing organization will not be consolidated into the accounts of The General Tire & Rubber Co., Akron, O., its parent company.

The purchase of RKO Pictures from Hollywood producer Howard Hughes will, therefore, have no effect on the current fiscal accounts of General Tire, Mr. O'Neil added, implying that no such incorporation of financial accounts is contemplated for the future.

The RKO Teleradio head also revealed that as a result of a recent sale of foreign rights to RKO's huge backlog of films, a General Tire loan of $5,000,000 has been repaid to the extent of $2,500,000.

News about People

Curt Harwick has joined the sales staff of Harwick Standard Chemical Co. of California, Los Angeles, Calif.

Wallace E. Cake, vice president of United States Rubber Co., has been named chairman of the rubber industry's campaign for the 1956 Greater New York Appeal of the National Foundation for Infantile Paralysis. Named chairman of the crude rubber section of the industry for the drive is **Marcus Rothschild,** M. Rothschild & Co., Inc., New York, N. Y.

John F. Snyder, Sr., director and vice president of Hooker Electrochemical Co., Niagara Falls, N. Y., has been transferred from the firm's Durez Plastics Division to the administrative group at Niagara Falls. **Jay C. Searer** and **Lother A. Sontag** have been advanced to production manager and technical manager, respectively, of Durez Plastics Division.

Robert A. Oberfell has been named assistant secretary of New Jersey Zinc Co., New York, N. Y.

John E. Kallgren has joined Congoleum-Nairn, Inc., Kearny, N. J., as chief engineer. He is a 23-year veteran of the rubber industry, having served in major engineering capacities with The Firestone Tire & Rubber Co., United States Rubber Co., and Seiberling Rubber Co.

W. R. Ayers has been advanced to assistant director of engineering for the plastics division of Monsanto Chemical Co., Springfield, Mass.

William H. Lotze has been promoted to manager of the tire mold division of National Rubber Machinery Co., Akron, O., succeeding **J. L. MacDonald,** who will remain with the firm in an advisory capacity.

Francis B. Speaker, an engineer with Hewitt-Robins, Inc., Stamford, Conn., has been appointed consultant on mining matters in the Office of Minerals Mobilization. He previously had served the government on the War Production Board and the Defense Materials Agency.

Russell E. Hanna has been advanced to manager of salaried employment for Seiberling Rubber Co., Akron, O., and **James M. Reynolds** has been transferred to the salaried personnel division.

A. P. Moss and **Max Hill** have been appointed industrial chemicals production manager and fine chemicals production manager, respectively, in the works manager's department of Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. **W. W. TenEyck** has been named superintendent of chemicals and resins at the company's South Charleston, W. Va., plant.

C. Stuart Brown has been named manager of advertising for American Viscose Corp., Philadelphia, Pa.

Thomas E. Kuby has joined Diamond Alkali Co., Cleveland, O., as assistant manager of public relations and advertising.

H. M. Hood, personnel manager of the Topeka, Kan., plant of The Goodyear Tire & Rubber Co., Akron, O., has been named manager of the company's new tire plant at Cali, Colombia, replacing **J. W. Holley,** who will join Goodyear's development department in Akron. **Alton A. Werner,** personnel manager at the company's Lincoln, Neb., plant, succeeds Mr. Hood at Topeka and will in turn be succeeded by **David E. Murray,** efficiency department manager in Lincoln.

Joseph E. Cox, associated since 1946 with Thermoid Co., Trenton, N. J., has been elected vice president of the company and general manager of Essex Rubber, one of its divisions. He is a 32-year veteran of the rubber industry.

Joseph E. Cox

Norbert S. Mason and **Robert J. Fawcett** have joined The B. F. Goodrich Co. Research Center, Brecksville, O., as a technical man and a research chemist, respectively.

W. M. Anderson and **J. K. Marshall** have been named district managers of the New York and Cleveland districts, respectively, of Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y.

Frank S. Griesinger, manager of the retread and repair materials section of The Goodyear Tire & Rubber Co., Akron, O., has been presented with the company's 40-year continuous service award.

Thomas E. Moffitt has been elected executive vice president and a director, and **R. Wolcott Hooker** has been elected senior vice president, of Hooker Electrochemical Co., Niagara Falls, N. Y.

J. V. Carlin, Jr., has been promoted to assistant general sales manager of Acme Rubber Mfg. Co., Trenton, N. J.

Philip A. Mulvey, Jr., has joined Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O., as sales representative in its Chicago office.

H. C. Howell has joined the Pioneer Products Division of Witco Chemical Co., New York, N. Y., as chief chemist for technical development.

Joseph W. Basista, a petroleum sales representative with The Goodyear Tire & Rubber Co., Akron, O., has been awarded the company's 30-year continuous service pin.

Walter J. Kaufman has been promoted to manager of the technical division of Watson-Standard Co., Pittsburgh, Pa.

Walter J. Kaufman

HOW YOU BENEFIT WHEN YOU USE SUN RUBBER PROCESS AIDS

IF YOU PROCESS	USE	BECAUSE
OIL EXTENDED POLYMERS GR-S TYPES 1703, 1707, 1708, 1801	**CIRCOSOL-2XH**	**Now Available at New Low Cost.** Has relatively low staining properties for use on white goods. Improves the rebound characteristics of GR-S vulcanizates. Assures constant uniformity with minimum downgrading.
OIL EXTENDED POLYMERS GR-S TYPES 1705, 1709, 1710	**SUNDEX-53**	**Versatile.** Gives quicker, more thorough plasticization. Highly compatible with natural rubber and reclaims as well as with GR-S rubber types.
NEOPRENE WHV	**SUNDEX-53**	**Highly Extended,** Neoprene WHV compounds can be made for prices comparable with those of low-cost elastomers.
REGULAR NEOPRENES and NATURAL RUBBER	**CIRCO LIGHT RUBBER PROCESS-AID**	**Gives True Softening** by physical changes in rubber structure rather than chemical. Large quantities can be absorbed without blooming.

To learn more about using Sun Rubber Process Aids to get better physicals, lower costs, and easier processing, see your Sun representative. Or write for your copy of Sun's latest Technical Bulletin describing any of the above products. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. RW-2.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

SUNOCO®

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

Raymond F. Boyer, director of plastics research for Dow Chemical Co., Midland, Mich., has been elected 1956 chairman of the American Chemical Society's Division of Polymer Chemistry, succeeding **Herman F. Mark,** director of the Institute of Polymer Chemistry, Polytechnic Institute of Brooklyn. Also elected were **Thomas G. Fox, Jr.,** laboratory head, Rohm & Haas Co., Philadelphia, Pa., vice chairman; and **Joseph Dec,** assistant manager of paper and organic products, Johns-Manville Corp., Manville, N. J., secretary-treasurer.

E. D. Kelly, director of the Office of Synthetic Rubber, Federal Facilities Corp., from 1952 until mid-1955, has been named administrative director of George Armistead & Co., Washington, D. C. Other governmental positions he has held include deputy director of the rubber division of the War Production Board and director of the rubber division of the National Production Authority.

Ralph R. Browning, Jr.

Ralph R. Browning, Jr., and **D. P. McAdoo** have been named manager and assistant manager, respectively, of the general industries sales division of J. M. Huber Corp., New York, N. Y.

E. H. Fitch, manager of the aeronautical products department of The B. F. Goodrich Tire & Equipment Division, Akron, O., has been elected a director of the Aviation Distributors & Manufacturers Association.

D. W. Cunningham has been advanced to manager of the passenger-tire sales department of The Seiberling Rubber Co., Akron, O., and has been succeeded as budget sales manager by **C. C. Edwards,** formerly Atlanta sales district budget supervisor.

Franklin K. Dietzler has joined the physics and electronics section, research division, of The Goodyear Tire & Rubber Co., Akron, O.

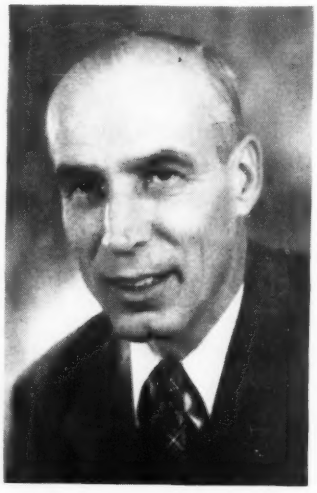
George E. Heller

George E. Heller has been advanced to assistant industrial sales manager of Taylor Instrument Cos., Rochester, N. Y. **Warren Gray, Roy Bailey,** and **Jack Barker** have been named managers of the firm's branch offices in Greensboro, N. C.; Houston, Tex.; and Atlanta, Ga., respectively.

Melvin E. Musselman has been advanced to assistant manager of the tire service division of The Dayton Rubber Co., Dayton, O.

George C. Johnson, promotional sales manager of Hamilton Rubber Mfg. Corp., Trenton, N. J., has been advanced to sales manager.

Frank S. Ward, general sales manager of Taylor Instrument Cos., Rochester, N. Y., has been elected to the firm's board of directors and to membership in the board's executive committee. Also elected to the executive committee were **Marc E. Porter,** assistant treasurer, and **Karl H. Hubbard,** technical director.



Frank S. Ward

Edward Beattie has been named Chicago district sales manager for Stauffer Chemical Co., New York, N. Y.

Robert S. Milliken has been named head of the New York, N. Y., sales and service office of the shoe products division of The Goodyear Tire & Rubber Co., Akron, O., and has been succeeded as head of the division's Cincinnati, O., sales office by **C. R. Jarvis,** formerly shoe products manufacturer's representative at Nashville.

Harold A. Brittain, since 1947 assistant to the production manager of Goodyear Foreign Operations, Inc., Akron, O., and associated with Goodyear since 1918, has retired. Mr. Brittain's varied career with the company includes service as machine and tire designer, fabric developer, general superintendent of the Wolverhampton, England, tire plant, and as supervisor of construction of plants in Luxembourg and Japan.

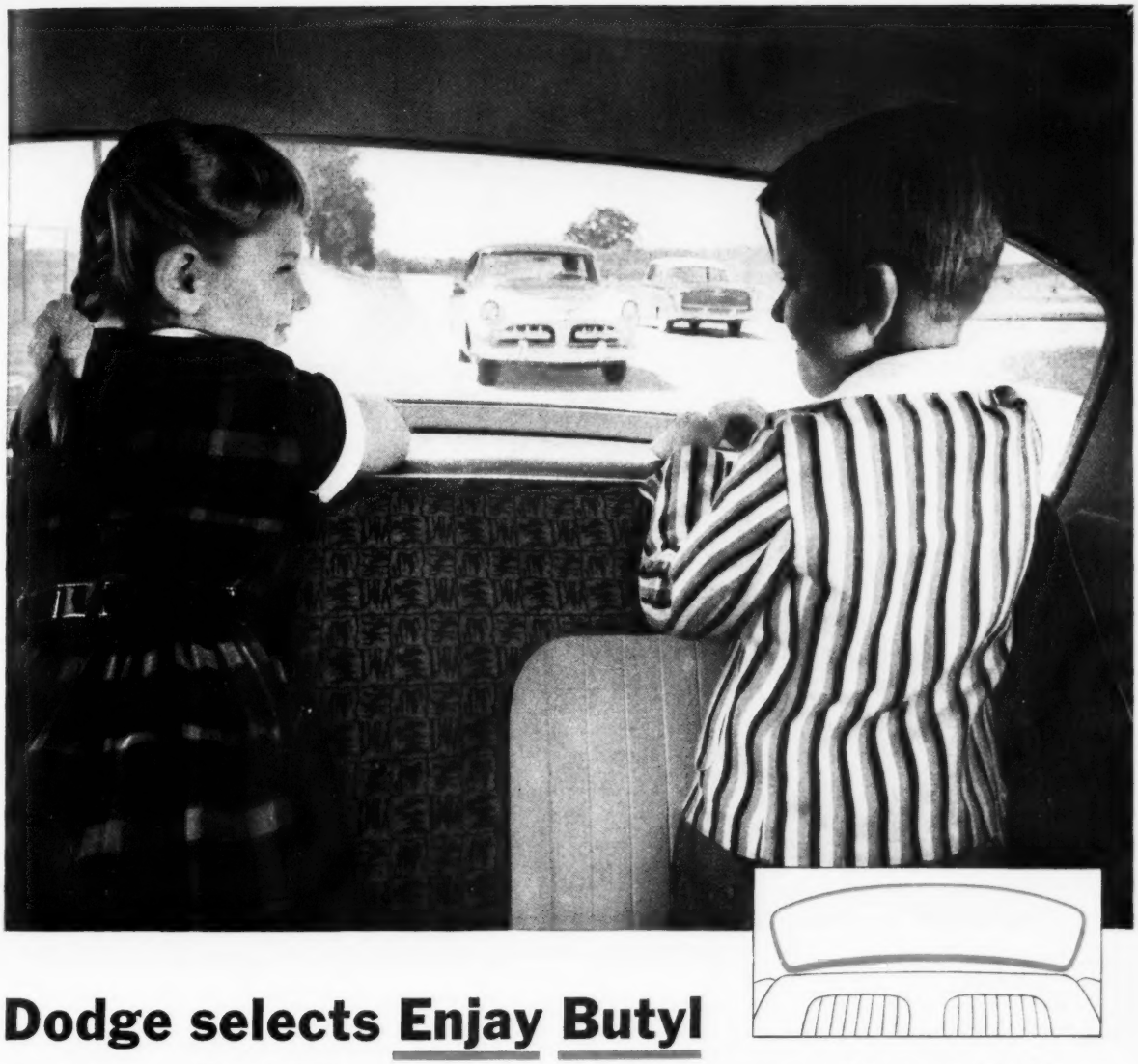
Claude L. Boring

Claude L. Boring has been advanced to general manager of Erie Foundry Co., Erie, Pa.

Harry W. Julian has joined The Seiberling Rubber Co., Akron, O., as representative of the government and manufacturers sales department.

E. H. Green has been advanced to executive vice president and chairman of the executive committee of C. K. Williams & Co., Baltimore, Md., and will be succeeded as general sales manager by **E. H. Kroepel,** formerly eastern division sales manager, a position to be assumed by **S. E. Richards.** Also advanced were **T. J. Stewart,** to general production manager, and **A. T. Pickens,** to East St. Louis works manager.

John H. Drexler, III, Cleveland sales representative for the chemical division of The Goodyear Tire & Rubber Co., Akron, O., has been transferred to the division's New York, N. Y., office.



Dodge selects Enjay Butyl rubber for big rear-window weatherstrip

Super-durable Enjay Butyl fits perfectly Dodge's rigid specifications for its rear-window weatherstrip. Under the toughest conditions of weather and use, Enjay Butyl parts stay like new, help add style and color to new cars. In fact, some automobiles have more than 100 parts made of this fabulous rubber.

The many advantages of Enjay Butyl make it the almost perfect rubber for the automotive industry. Its price and ready availability are advantages, too. And it is now available in non-staining grades for *white* and *light-colored* parts. For full information and for skilled technical assistance in the uses of Enjay Butyl, contact the Enjay Company at either of the addresses below.

ENJAY

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.
District Office: 11 South Portage Path, Akron 3, Ohio.

ENJAY BUTYL

Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

36 SUCCESSFUL YEARS OF LEADERSHIP IN SERVING INDUSTRY

Daniel J. Chovan has joined Witco Chemical Co., New York, N. Y., as technical sales representative for rubber chemicals.

Austin L. Hawk has been named manager of the western sales district of Raybestos-Manhattan, Inc., Passaic, N. J., succeeding **J. B. Wittrup**, who has retired. Newly appointed to the district's Chicago office are **H. C. Abrams**, regional manager; **Arthur Arguedas**, supervisor of belt sales and engineering; and **G. E. Lawrence**, supervisor of agricultural sales.

Ormond R. Gillen and **F. Joseph Triggs, Jr.**, have been added to the sales staff of The Goodyear Tire & Rubber Co.'s chemical division, Akron, O.

William S. Richardson, president, The B. F. Goodrich Co., Akron, O., completing 30 years of service with the company, was presented with a gift by Chairman of the Board John L. Collyer in commemoration of the event.

E. W. Prendergast has been made regional manager of the southeast sales territory of The Foxboro Co., Foxboro, Mass. **G. W. Reed, Jr.**, and **J. K. Younkins** have been named managers of the firm's New Orleans and Charleston, W. Va., sales offices, respectively. Industrial engineers appointed to branch offices include **R. F. Sutton**, Lakeland, Fla.; **H. C. Craig**, Jacksonville; **L. C. Estes**, Atlanta; **W. H. Rhyne**, Chattanooga; **T. A. Jones**, Charlotte; and **M. N. Walker**, Knoxville.

George A. Delaney, chief engineer of General Motors' Pontiac Motor Division, has become president of the Society of Automotive Engineers, succeeding **C. G. A. Rosen**, Caterpillar Tractor Co.

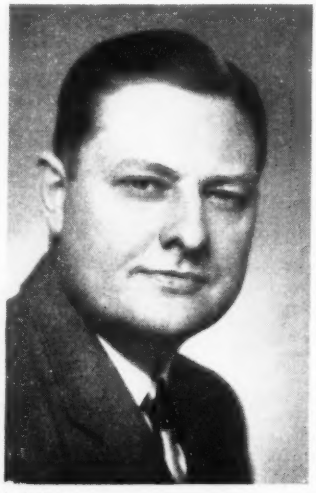
Laurice W. McCallum has joined J. M. Huber Corp., New York, N. Y., as southeast technical sales representative.

Laurice W. McCallum

W. N. Stoops has been appointed associate director of the research department of Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y., and **H. C. Chitwood, B. J. Cottrell, Benjamin Phillips, G. M. Powell**, and **A. T. Walter** have been appointed assistant directors. Named assistant to the director of the department was **D. M. Young.**

Miss Joan Butler has joined the research and development department of the Barrett Division, Allied Chemical & Dye Corp., New York, N. Y., as technical writer.

Alvin L. McMullen, production superintendent of Seiberling Rubber Co., Akron, O., has been advanced to manager of production, and **Edwin P. Shrank**, chief staff engineer, has been promoted to manager of engineering. Also advanced was **Irvin R. Heller**, project engineer, to chief staff engineer.



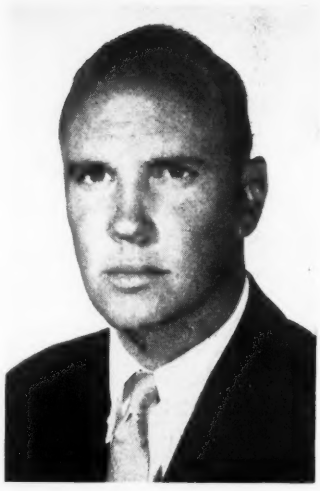
Pach Bros.

G. R. Cuthbertson

G. R. Cuthbertson has been advanced to assistant general manager of the tire division of United States Rubber Co., New York, N. Y., and has been succeeded as production manager of the division by **R. E. Behrman**, formerly assistant production manager.

Edward H. Hunnicutt, factory manager of the Pottstown, Pa., tire plant of The Firestone Tire & Rubber Co., Akron, O., has been named plant manager of the company's Los Angeles, Calif., tire plant, succeeding **R. E. McGee**, who died last November.

George F. Comienski has been appointed manager of general merchandise and material control at the New Bedford, Mass., plant of The Goodyear Tire & Rubber Co., Akron, O., and will be succeeded as the firm's manager of aviation products merchandise distribution by **Norman L. Ott**, formerly a member of the industrial products merchandise division.



Austin Goodyear

Austin Goodyear, vice president and general manager of the industrial rubber, machinery, and engineering divisions of Hewitt-Robins, Inc., Stamford, Conn., has been promoted to executive vice president of the company.

Peter F. Casella has been appointed manager of the patent section, research and development department, of Hooker Electrochemical Co., Niagara Falls, N. Y.

James Y. Oldshue has been advanced to director of research for Mixing Equipment Co., Inc., Rochester, N. Y.

C. E. Draper, assistant to the factory manager of The Sun Rubber Co., Barberton, O., has been advanced to technical director.

John D. Beggs has joined National Starch Products, Inc., New York, N. Y., as sales director of vinyl resins to the paint and other protective coatings industries.

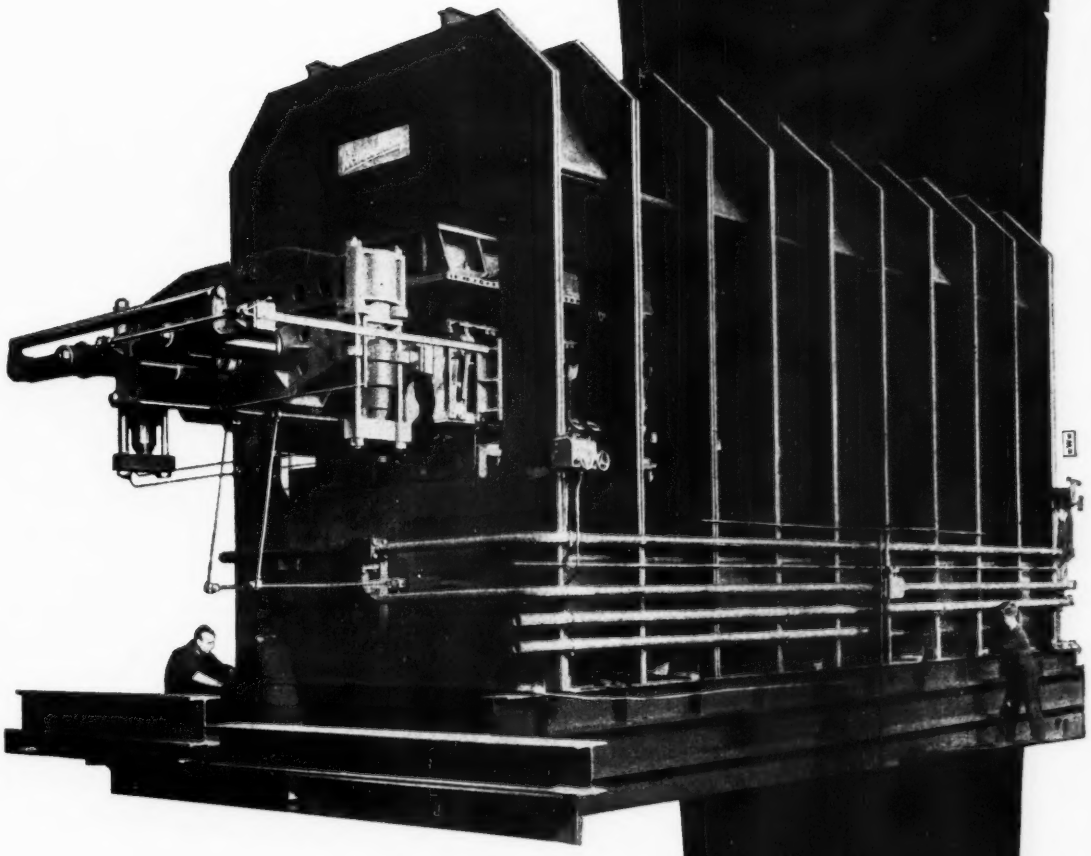
John W. Reavis has been named to the board of directors of Diamond Alkali Co., Cleveland, O. He holds directorships in such other firms as Harshaw Chemical Co., Industrial Rayon Corp., and Midland Steel Products Co.

Daniel F. Martine has been advanced to industrial relations manager for the chemical division of The General Tire & Rubber Co., Akron, O.

Harry M. Walker has been promoted to manager of research development at the Texas City, Tex., research laboratories of the plastics division of Monsanto Chemical Co.

John V. Reilly and **Martin H. Smith** have been appointed sales representatives for Baker Castor Oil Co., New York, N. Y.

Siempelkamp



Hydraulic Rubber Belt Presses

Dimensions up to 10 feet wide by 50 feet long

The Leading Rubber Factories in Europe use Siempelkamp Belt Presses

All points outside U. S. A. send inquiries direct to:

G. SIEMPELKAMP & CO., KREFELD, WEST GERMANY
(Established 1883)

Telex 0853 811 Cable: Siempelkampco

REPRESENTATIVE IN U. S. A. TO RUBBER AND PLASTICS INDUSTRIES

WILLIAM TAPPER 30 SOUTH BROADWAY, YONKERS, NEW YORK

Phone: Yonkers 3-7455 Cable: Wiltapper

Joseph E. Ross has been advanced to leader of the tire yarn section, research and development division, American Viscose Corp., Philadelphia, Pa., succeeding **Wayne A. Sisson,** who has been named leader of the division's cellulose section.

Martin G. Levens has been advanced to Philadelphia district sales manager for Columbia-Southern Corp., Pittsburgh, Pa., succeeding **Paul A. Fodor, Jr.**, now assistant director of sales.

Raymond A. All has been appointed assistant to the vice president and general manager of the textile division of United States Rubber Co., New York, N. Y.

Salvadore P. Lio has been named assistant sales manager for styrene molding materials in the plastics division of Monsanto Chemical Co., Springfield, Mass.

Charles T. Tinsley has been named assistant sales manager of the industrial rubber division of Thermoid Co., Trenton, N. J.

James L. Foster, associated with the B. F. Goodrich Chemical Co., Cleveland, O., since 1944, has been reassigned to the sales department of Goodrich-Gulf Chemicals, Inc., Cleveland.

Frank J. Milo has joined Rhodia, Inc., New York, N. Y., as sales representative.

James W. Cooley, publicity director for The Wooster Rubber Co., Wooster, O., has been made head of the company's marketing research division.

Anthony J. DiMaggio, since 1950 chief chemist of the Pottstown, Pa., tire plant of the Firestone Tire & Rubber Co., Akron, O., has been named production manager of that plant. He has been with the company since 1943.

Anthony J. DiMaggio

Henry J. Ogorzaly, assistant director of the petroleum development division of Esso Research & Engineering Co., New York, N. Y., has been named to follow the firm's nuclear activities affecting chemical and petroleum processes and products quality. **Edward J. Gornowski** has been appointed assistant director of the division.

V. J. Bjacek, manager of the foreign technical service department of Wellco-Ro-Search, Waynesville, N. C., is completing a year-long inspection trip abroad with visits to Wellco-affiliated shoe factories in Indonesia, Malaya, Hong Kong, and Taiwan.

Earl Kochersperger has been appointed eastern regional sales manager of coated fabrics for United States Rubber Co., New York, N. Y.

Martin Vander Laan has been appointed manager of operations of the engineering division of Hewitt-Robins, Inc., New York, N. Y.

Kenneth Quinn, formerly with Quaker Rubber Division, H. K. Porter Co., has joined the technical staff of Moreland Corp., Willow Grove, Pa.

A. J. Sears, of the dealer department of The Goodyear Tire & Rubber Co., Akron, O., and **C. C. Osmun,** of the sales manager's office, will retire after 44 and 31 years of service with the company respectively.

James H. Alexandre, formerly with American Cyanamid Co., has joined American Synthetic Rubber Corp., New York, N. Y., as secretary and executive assistant to the president.

J. A. Muller, executive engineer of the industrial rubber products division of Thermoid Co., Trenton, N. J., has been appointed technical manager of the rubber division.

John W. Pozerycki has been appointed plant manager of International Packings Corp., Bristol, N. H., and **John W. Reedy** has been named quality manager.

Spencer Johnson has joined Spencer Products Co., Ridgewood, N. J., and will be engaged in the development of new products for the rubber and related industries.

William H. Spratling has been advanced to assistant director of purchases for United States Rubber Co., New York, N. Y.

Walter E. Floyd has been advanced to superintendent of the Cartersville, Ga., textile mills of The Goodyear Tire & Rubber Co., Akron, O., succeeding **Guy I. Parmenter,** who has retired.

Edward B. Lukas

Edward B. Lukas has been promoted to technical service representative for Velsicol Chemical Corp., Chicago, Ill.

H. A. Voskamp, Jr., manager of thermoplastic sales for Barrett Division of Allied Chemical & Dye Corp., New York, N. Y., has been named assistant manager of molding compound sales.

James D. Russell, associated since 1946 with Young Bros. Co., Cleveland, O., has been elected vice president and general manager.

Joseph R. Calistro, formerly with Connecticut Hard Rubber Co., has joined H. O. Canfield Co., Bridgeport, Conn., as supervisor of the engineering department. Also newly associated with H. O. Canfield is **Paul I. Hastings,** now chief chemist, who was formerly with The Firestone Industrial Products Co.

Pennsylvania Industrial Chemical Corp., Clairton, Pa., has opened a new warehouse, its thirteenth, at 1440 W. 8th St., Cincinnati, O.

Foster D. Snell, Inc., New York, N. Y., has appointed Biochemical Procedures, Beverly Hills, Calif., as its West Coast laboratory.

Synvar Corp., Wilmington, Del., has moved its offices to 726 King St., in that city.

Darlington Chemicals, Inc., Philadelphia, Pa., has appointed B. E. Dougherty Co., Los Angeles, Calif., western sales representative for its magnesium oxide, magnesium carbonate, and magnesium hydroxide.

Union Carbide & Carbon Corp., silicones division, New York, N. Y., has reduced the prices of its dimethyl silicone oils and emulsions by 7½¢ a pound.

NEW

PLASTOLEIN® 9404 TGP

a superior
synthetic rubber plasticizer
at lower cost!

New Plastolein 9404 TGP (triethylene glycol dipelargonate) offers superior performance in synthetic rubbers. Yet it *costs less* than commonly used low-temperature plasticizers.

For example, as compared to other more expensive glycol-type esters and adipate plasticizers, 9404 gives lower heat loss, lower compression set, less water sensitivity and equivalent low-temperature flexibility.

In addition, since Plastolein 9404 is produced in accurately controlled equipment from easily obtainable domestic raw materials, high quality standards are maintained and continuing availability assured.

For detailed information on Plastolein 9404 TGP, mail coupon, or write for an evaluation sample.

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

New York • Philadelphia • Lowell, Mass. • Chicago • San Francisco • Cleveland
Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles
Export: Carew Tower, Cincinnati 2, Ohio

Emery Industries, Inc.
Dept. B-2, Carew Tower, Cincinnati 2, Ohio

Please send me bulletin on Plastolein 9404 TGP.

Name.....*Title*.....
Company.....
Address.....
City.....*State*.....

Obituaries

S. D. Douglas

S. D. Douglas, recently appointed senior scientist in the research department of Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y., died January 15 at Houston, Tex., after a long illness.

A renowned plastics researcher, Dr. Douglas was awarded the plastics industry's John Wesley Hyatt gold medal in 1944. Union Carbide credits his 17 years of study and development of plastics with making possible the increased production of vinyl resins, which saved thousands of tons of rubber during World War II and helped America's postwar economy.

Dr. Douglas joined Carbide & Carbon in 1926 after having been graduated from Middlebury College and after having received his M.S. and Ph.D. degrees in chemistry from the University of Pennsylvania. He was appointed assistant director of research in 1944.

He was a member of the American Chemical Society, the Society of the Plastics Industry, and the Society of Plastics Engineers.

William Y. Duncan

William Y. Duncan, formerly an executive of Akron Standard Mold Co., Akron, O., died December 12 after a long illness at his home in New Haven.

He was born in Overbrook, Pa., December 17, 1890. Mr. Duncan was graduated from the U. S. Navy Ordnance School and the Naval Mine Warfare School and served in the Navy during both World Wars. At his death he held the rank of Captain, ret., in the USNR.

A full military burial service was held at the National Cemetery, Arlington, Va., on December 14.

Surviving are his wife, a son, and two brothers.

Carl G. Knarzer

Carl G. Knarzer, assistant general traffic manager of United States Rubber Co., New York, N. Y., died suddenly December 30. He was 57.

He started with the company in 1930 in its Indianapolis plant and was assigned to the New York general offices in 1943, where he remained until his death. The deceased was a member of U. S. Rubber's 25-Year Club.

A Requiem Mass was offered at St. Mary's Church, Rutherford, N. J., on January 3, and interment was in Calvary Cemetery, Paterson, N. J.

Mr. Knarzer is survived by his wife, his mother, three daughters, and a sister.

Robert S. Pope

Robert S. Pope, since 1946 personnel manager of the Los Angeles, Calif., plant of The Goodyear Tire & Rubber Co., Akron, O., died December 20 after a long illness. He was 59.

Born in Fort Gibson, Okla., Mr. Pope joined Goodyear in Akron in 1919 as secretary to the chief engineer and served, successively, as secretary to the superintendent of the Los Angeles plant, secretary to Chairman of the Board P. W. Litchfield, as personnel manager of Goodyear plant in Los Angeles, as assistant to Mr. Litchfield, again in Akron, assistant personnel manager at Akron, manager of personnel of Goodyear Aircraft Corp., as manager of personnel of the parent company, and then as director of personnel.

Mr. Pope is survived by his wife and a son.

•

Tiargi Party

(Continued from page 681)

Arensmeyer, Ratliff Rubber Co.; Neil Pestal, The Firestone Tire & Rubber Co.; Dan Budnick, Kirkhill Rubber Co.; and F. C. Johnston, Caram Mfg. Co.

Two Speak on Automation Before Philadelphia Group

"Automation in the Rubber Industry" was the subject of two talks given by Ingram Richardson and W. M. Young, both of Richardson Scale Co., Clifton, N. J., before the Philadelphia Rubber Group at the Poor Richard Club, Philadelphia, Pa., January 13. In attendance were 127 members and guests.

Mr. Richardson described a number of automatic weighing installations serving internal mixers which have been put into operation in several rubber plants during the past few years. These installations ranged from semi-automatic compounding systems, where only some of the ingredients were handled and weighed automatically, to the fully automatic system, designed to control as much as 43 items of pelletized rubber, oils, blacks, and other compounding materials.

The equipment company executive emphasized the importance of properly engineered materials handling equipment and storage bins in the success of the automatic system. The best possible weighing and control system cannot function as intended if the materials flush or hang up in the bins, he declared. Similarly, special attention must be given to the type and the design of feeders assigned to handle difficult compounds in a rubber plant.

Mr. Young, chief electrical engineer of the company, described the principles and operations of various weighing and control methods. He explained how the punch-card principle can control the material selection, material routing to and from the scale, and the material amount for an unlimited number of operations. Date reduction instruments and their relation to automatic scales were also dealt with.

The business portion of the meeting included the reading of the year-end financial statement by outgoing Secretary-Treasurer R. J. Salyerds, Harwick Standard Chemical Co. A. L. Shaw, The B. F. Goodrich Co., presented the report of the Group's nomination committee.

Officers and directors nominated and elected for the new term were the following: Mr. Salyerds, chairman; J. R. Mills, Goodall Rubber Co., vice chairman; R. Garrett, Armstrong Cork Co., secretary-treasurer; T. E. Farrell, The Firestone Tire & Rubber Co., director; and R. N. Hendriksen, Phillips Chemical Co., director.

Canadian Polymer Forum

A Canadian High Polymer Forum, the seventh of its kind, will be held at the Guildwood Inn, Sarnia, Ont., Canada, November 8 and 9, 1956, under the cosponsorship of the National Research Council of Canada and the Chemical Institute of Canada.

Authors of papers are requested to notify the program chairman, D. G. Ivey, Department of Physics, University of Toronto, Toronto 5, Ont. Abstracts and final titles will be required by August 31.

Double rooms may be reserved by writing the Guildwood Inn, P. O. Box 912, Point Edward, Ont., or H. Leverne Williams, chairman, Seventh Canadian High Polymer Forum, Polymer Corp., Ltd., Sarnia, Ont.

Financial

Firestone Tire & Rubber Co., Akron, O. Year ended October 31, 1955: net income, $55,378,916 (a record), equal to $6.81 a share, compared with $40,509,944, or $5.0_ a share, in the preceding fiscal year; net sales, $1,114,870,187, against $916,047,040; income taxes, $58,900,000, against $41,000,000; current assets, $433,674,077, current liabilities, $125,488,750, against $395,536,295 and $94,832,746, respectively, on October 31, 1954.

Flintkote Co., New York, N. Y. Forty weeks to October 8, 1955: net profit, $3,961,528, equal to $2.86 a share, against $3,822,208, or $2.83 a share, in the 1954 weeks.

Liquid Carbonic Corp., Chicago, Ill. Last quarter, 1955: net income, $510,839, equal to 45¢ a share, against $348,918, or 30¢ a share, in the 1954 quarter.

Average hourly output using Silastic 401 Gum
Average hourly output using ordinary silicone gum
TOLEDO
NO SPRINGS · HONEST WEIGHT
TOLEDO
NO SPRINGS · HONEST WEIGHT

SILASTIC 401 GUM

increases mill output 30%... reduces production costs!

Silastic 401 gum is easier to mill than other silicone rubber gums.* In actual production timing tests, a mill produced 122 pounds of stock per hour using Silastic 401 Gum versus 79 pounds using a conventional silicone gum. By reducing compounding time, *Silastic 401 Gum* assures more efficient use of your mills and saves capital investment in extra equipment. Furthermore, stocks compounded of *Silastic Gums* are exceptionally easy to mold and extrude. So, from every standpoint, *Silastic Gums* give you easier, faster processing and lower over-all production costs.

Remember, too — Dow Corning's 10 years of experience in compounding silicone rubber is at your service . . . either in the field or at Midland, Michigan, where you are invited to see for yourself the speed and results of compounding with *Silastic Gums.*

These Silastic PROPERTIES mean better products... *Low compression set without toxic additives. Serviceable at temperatures ranging from —100 F to 500 F. Withstands weathering, ozone, corona. An ideal dielectric material. Can be compounded for high tensile strength.*

Your source for all silicone RESEARCH materials... *Dow Corning offers the most complete line of silicone rubber gums to be found — sulphur vulcanizing, peroxide vulcanizing, and fluid types. They're always available in sample quantities . . . and new types are being developed constantly!*

*TM REG. U.S. PAT. OFF.

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

Send this coupon today for additional information, FREE samples!

Dow Corning Corporation
Midland, Mich., Dept. 9402

Please send me ☐ additional information ☐ free samples of Dow Corning Silastic 401 Gum.

Name _____ Title _____

Company _____

Address _____

Boston Woven Hose & Rubber Co., Cambridge, Mass. Quarter ended November 30, 1955: net income, $152,096, equal to 38¢ a share, compared with $61,349, or 11¢ a share, in the 1954 quarter; net sales, $4,895,140, against $3,920,326.

Collins & Aikman Corp., New York, N. Y. Nine months to November 26, 1955: net profit, $766,500, equal to $1.37 a share, contrasted with net loss of $760,391 in the prior year's period.

Dow Chemical Co., Midland, Mich., and subsidiaries. Six months ended November 30, 1955: net earnings, $28,339,615, equal to $1.22 each on 23,284,712 common shares, against $16,551,869, or 71¢ each on 16,551,869 shares, a year earlier; net sales, $272,971,210, against $222,096,806.

Dayton Rubber Co., Dayton, O., and subsidiaries. Year ended October 31, 1955: net income, $2,321,477, equal to $3.77 a common share, compared with $1,152,411, or $1.80 a share, in the preceding fiscal year; net sales, $69,150,073, against $55,923,543; federal income taxes, $2,660,472, against $1,177,709; current assets, $25,568,452, current liabilities, $9,334,495, against $20,044,288 and $9,470,670, respectively, on October 31, 1954.

General Cable Corp., New York, N. Y. Nine months to September 30, 1955: net income, $4,202,434, equal to $1.76 a share, against $3,562,925, or $1.58 a share, in the like months of 1954.

Glidden Co., Baltimore, Md., and subsidiaries. Quarter ended November 30, 1955: net profit, $1,939,978, equal to 85¢ each on 2,295,350 common shares; net sales, $54,479,528.

Goodall Rubber Co., Trenton, N. J. Nine months ended September 30, 1955: net earnings, $348,790, equal to $2.45 a share, compared with $131,580, or $1.08 a share, a year earlier.

The B. F. Goodrich Co., Akron, O. First three quarters, 1955: consolidated net income, $32,395,212, equal to $3.66 a common share, against $27,371,729, or $3.11 a share, in the same period of 1954; net sales, $561,924,350, against $466,999,115.

Goodyear Tire & Rubber Co., Akron, O. Nine months ended September 30, 1955: consolidated net profit, $43,659,000, equal to $4.32 a common share, compared with $31,798,688, or $2.94 a share, a year earlier; net sales, $1,025,447,000, against $789,177,842.

Hewitt-Robins, Inc., Stamford, Conn. January 1-September 30, 1955: net income, $818,192, equal to $2.55 a share, compared with $636,361, or $2.10 a share, in the 1954 period; net sales, $32,871,772, against $26,410,944.

Johnson & Johnson, New Brunswick, N. J. Nine months ended September 30, 1955: net profit, $9,217,000, equal to $4.38 a share, compared to $7,701,000, or $3.63 a share, in the 1954 period.

Lee Rubber & Tire Corp., Conshohocken, Pa., and domestic subsidiaries. Year ended October 31, 1955: net profit, $1,750,071, equal to $2.06 a capital share, compared with $1,400,295, or $1.66 a share, in the preceding fiscal year; net sales, $45,912,226, against $39,385,382; federal income taxes, $1,981,500, against $1,532,000; current assets, $22,797,444, current liabilities, $4,679,048, against $21,559,631 and $3,666,339, respectively, on October 31, 1954.

McNeil Machine & Engineering Co., Akron, O. Nine months ended September 30, 1955: net earnings, $1,698,298, equal to $2.94 a share, contrasted with $2,209,411, or $4.01 a share, in the 1954 period.

Minnesota Mining & Mfg. Co., St. Paul, Minn., and domestic and Canadian subsidiaries. First nine months, 1955: net earnings, $24,685,380, equal to $2.99 a common share, against $17,308,226, or $2.11 a share, in the '54 quarters; sales, $202,713,004, against $167,767,471.

Mt. Vernon-Woodberry Mills, New York, N. Y. Nine months to September 30, 1955: net earnings, $788,000, equal to $1.20 a share, contrasted with $389,000, or 60c a share, a year earlier.

National Automotive Fibres, Inc., Trenton, N. J. Nine months to September 30, 1955: net earnings, $1,576,886, contrasted with net loss of $326,141 a year earlier.

National Lead Co., New York, N. Y. Nine months ended September 30, 1955: net profit, $34,207,846, equal to $2.86 a share, against $25,776,390, or $2.14 a share, in the corresponding period of the previous year.

National Rubber Machinery Co., Akron, O. Nine months ended September 30, 1955: net income, $451,102, equal to $2.31 a share, against $444,212, or $2.27 a share, a year earlier.

National-Standard Co., Niles, Mich. Year ended September 30, 1955: net income, $2,479,640, equal to $4.93 a share, compared with $1,642,690, or $3.26 a share, in the preceding fiscal year.

Okonite Co., Passaic, N. J. First three quarters, 1955: net income, $1,123,261, equal to $6.19 a share, compared with $701,866, or $4.11 a share, a year earlier.

Raybestos-Manhattan, Inc., Passaic, N. J. January 1-September 30, 1955: net income, $2,864,724, equal to $4.56 a share, compared with $1,665,165, or $2.65 a share, in the same months of the previous year.

New Jersey Zinc Co., New York, N. Y., and subsidiaries. January 1-September 30, 1955: net income, $3,696,940, equal to $1.89 each on 1,960,000 capital shares, against $2,597,010, or $1.33 a share, a year earlier.

O'Sullivan Rubber Corp., Winchester, Va. First three quarters, 1955: net loss, $20,820, contrasted with net profit of $51,080 a year earlier.

Phelps Dodge Corp., New York, N. Y. and subsidiaries. First nine months, 1955: net income, $46,718,438, equal to $4.61 each on 10,142,520 capital shares, compared with $29,517,069, or $2.91 a share, in the 1954 months; sales, $241,766,893, against $202,357,215.

Pittsburgh Plate Glass Co., Pittsburgh, Pa., and consolidated subsidiaries. First three quarters, 1955: net earnings, $45,377,010, equal to $4.87 a share, contrasted with $27,530,062, or $2.99 a share, in the 1954 months; sales $428,949,999, against $309,278,171.

Rome Cable Corp., Rome, N. Y. Six months to September 30, 1955: net profit, $851,000, equal to $1.68 each on 505,911 common shares, contrasted with $412,000, or 82¢ each on 499,425 shares, in the 1954 months.

St. Joseph Lead Co., New York, N. Y. First nine months, 1955: net income, $9,142,890, equal to $3.37 a share, contrasted with $4,967,003, or $1.83 a share, in the '54 period.

Seiberling Rubber Co., Akron, O. First nine months, 1955: net earnings, $834,149, equal to $1.74 a common share, contrasted with $231,253, or 19¢ a share, in the corresponding period the year before; net sales, $34,193,324, against $27,180,252.

West Virginia Pulp & Paper Co., New York, N. Y., and consolidated subsidiaries. Year ended October 31, 1955: net income, $15,724,000 (a new high), equal to $3.08 each on 4,934,888 common shares, compared with $13,096,000, or $2.57 each on 4,906,768 shares, in the preceding fiscal year; net sales, $176,237,000 (another record), against $164,843,000; federal income taxes, $15,000,000, against $12,000,000.

The Wooster Rubber Co., Wooster, O., and wholly owned subsidiary. Year ended September 30, 1955: net earnings, $1,287,569 (a new high), equal to $1.25 a common share, compared with $854,575, or 83¢ a share, in the preceding fiscal year; net sales, $15,797,293 (another record), against $12,176,885; provision for federal income taxes, $1,383,000, against $927,533; current assets, $5,141,237, current liabilities, $3,028,095, against $4,107,202 and $2,019,447, respectively, on September 30, 1954.

(*Continued on page 726*)

Of Special Interest to Canadian Rubber Manufacturers . . .

The Rubber Regenerating Co Ltd

TRAFFORD PARK · MANCHESTER · ENGLAND

The Largest Producers of Reclaimed Rubber in the British Empire!

- *High grade reclaims from ALL NATURAL rubber scrap*
- *Competitive prices*
- *Prompt shipment*
- *Delivery direct to customer's plant*
- *Local stocks*
- *Continuity of supply*

For samples, prices and further particulars apply to our sole agents in Canada

H.L.BLACHFORD Limited

MONTREAL :- 977 Aqueduct Street

TORONTO :- 360 Old Weston Road

News from Abroad

Great Britain

Seventeenth Annual Report of the BRPRA

The seventeenth annual report of the BRPRA (British Rubber Producers' Research Association), covering activities during 1954, again testifies to the fruitful efforts of this organization.

The study on non-rubber constituents of latex was continued on serum proteins, and examination of the lutoid fraction started; differences discovered in protein composition are to be further investigated for their bearing on latex stability and variability.

Vulcanization

Research on the basic chemistry of sulfur vulcanization, and the products of reaction extended to the influence of various activators of vulcanization, has yielded results which, combined with relevant kinetic data, have led the investigators to favor a reaction mechanism involving polar rather than free radical entities—a concept which throws new light on accelerator action. New interest attaches to peroxide vulcanization from the discovery of a new peroxide, dicumyl peroxide, which gives non-reinforced vulcanizates with better tensile properties than obtained with peroxides previously employed; carbon-black vulcanizates with tensile properties comparable to those of sulfur-cured compounds; and vulcanizates—rather heavily loaded with cheap rubber fillers like clay and whiting—which retain the strength of unfilled rubbers to a surprising degree. These vulcanizates are being tested under service conditions in electrical equipment, where freedom from staining the metal is important. Other properties, as aging, are being investigated.

Oxidative Degradation

In work on oxidative deterioration, chemical and stress-relaxation studies were undertaken; the former involved studies on the reaction of saturated and unsaturated sulfides with (1) hydroperoxides (products of the oxidation of unvulcanized rubber); (2) with molecular oxygen; and (3) with an oxidizing hydrocarbon. New knowledge was gained on the reaction of unsaturated sulfides. In system (3) it was seen that unsaturated sulfides and some disulfides can act as powerful oxidation retarders.

In the stress-relaxation work, measurements of stress decay in a stretched vulcanized rubber strip showed that breakdown at the cross-links is far more important than breakdown in the parent rubber chains between the cross-links, which fact points up the need of careful study of methods of vulcanizing to produce highly stable cross-linkages.

Interpolymers

It was definitely shown that in cold mastication of rubber, the free radicals at the end of the ruptured rubber molecules actually combine with special additives, and further work led to the production of novel interpolymers of natural rubber and synthetic elastomers by cold mastication *in the absence of oxygen*. Such an interpolymer of natural rubber and neoprene, cured by a neoprene recipe, gave a satisfactory vulcanizate which also had quite distinctive solubility properties.

New research on polymerization retardation by natural rubber in the production of Heveaplus M (polymer-modified rubber) revealed that the polymerizing monomer—as typified by vinyl acetate—attacks polyisoprenes readily, but thereby produces very unreactive entities unable to induce further polymerization. It was also shown that retardation of polymerization increases as the size of the polyisoprene molecule increases. No definite explanation has as yet been found for these effects, but they are thought to reflect the development of special colloidal properties as molecular size increases.

About 2,000 pounds of methyl methacrylate and styrene-modified rubbers have been prepared and distributed to 81 manufacturers in Britain, Europe, and the United States.

Technology

On the technological side, we learn that laboratory experiments aiming at utilizing the polymer-reinforcement of polymer-modified latex to obtain lighter products (foam rubber), without loss of bulk stiffness, have yielded encouraging results, although certain deficiencies, chiefly wet-gel strength, must be mitigated. Even so, the report states, several firms are keenly interested in these developments, and one—producing articles from hundred-gallon batches—not only obtained the required lower density articles, but found some improved processability.

Most of the work on dry rubber technology was undertaken in collaboration with individual firms for specific applications, which cannot yet be revealed. Independent evaluation and testing by manufacturers who received samples, generally confirmed the original claims and limitations of the materials.

Products with higher polymer content, intended for hard, impact-resistant materials, competitive with thermosetting resins, are receiving more attention and are being evaluated industrially. As to monomers other than methyl methacrylate and styrene, ethyl acrylate gave modified rubbers with superior aging qualities, which could not, however, be satisfactorily vulcanized.

Work on acrylonitrile confirmed earlier experience of the Institut Français du Caoutchouc that it is difficult to obtain from it an oil-resistant modified rubber without substantial loss in rubberiness and processability.

The work on tear resistance showed that tear behavior is affected by the internal viscosity of the rubber and certain changes in physical structure at the tip of the growing tear. A detailed study of the interplay of these two factors under different conditions is indicating how rubber should be modified physically for optimum tear resistance in given conditions. The action of reinforcing fillers in improving tear resistance could be related to the changes at the tip of the tear, and it is becoming possible to classify the fillers accordingly.

Further progress was made in improving low-temperature properties of natural rubber by lowering the brittle point and reducing the tendency to crystallization, which is reflected in the stiffening of rubber. The special compounding procedure recommended by the Association for a lower brittle point (down to —80° C.) has been adopted by several firms for specific products, mainly for the services. Products which crystallize about 100 times slower than standard vulcanizates were obtained by modifying natural rubber with small additions of certain sulfur compounds. It was shown that with suitable plasticizers natural rubber compounds are obtainable which retain flexibility at lower temperatures than any commercial synthetic rubber except special-purpose silicone materials.

Technical Developments, Ltd.

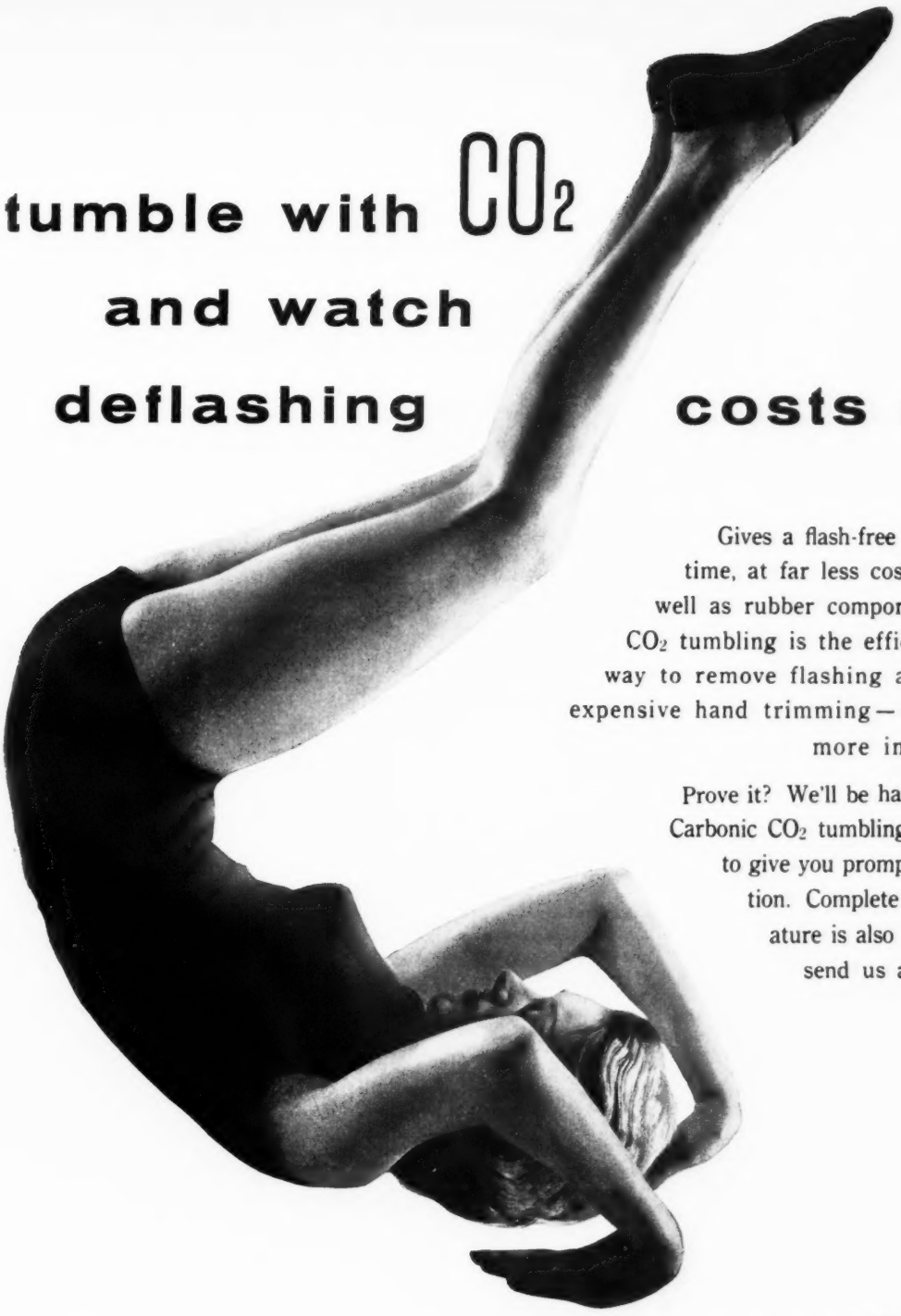
The activities of Rubber Technical Developments, Ltd., included the erection of plant for the Rubber Research Institute, Malaya, to produce about 350 tons of cyclized rubber annually, and the development at Welwyn of solid and microcellular cyclized rubber soling which met the specifications of the Shoe & Allied Trades Research Association. New industrial production is reported of various depolymerized rubber compositions (liquid rubber) and their use in printers' rollers. The possibility is being explored of using this rubber for flexible dies to mark drums by the "Pak Print" process and for "potting" delicate instruments and apparatus to withstand vibration and shock.

Commercial production of a rubber-bonded unwoven fabric for garment interlinings was started, and work at Welwyn now is centered on improving methods and broadening the field of application. Manufacturers are showing interest in Positex-treated carpets, and others are collaborating in trying out a new process for making rubber-impregnated fiber-board.

More Carbon Blacks

When the important expansion program under way at the works of Cabot Carbon, Ltd., in Stanlow, Cheshire, is completed about the middle of 1956, production capacity of the oil furnace type of carbon blacks now in demand in the United Kingdom and in the export market will be

tumble with CO_2 and watch deflashing costs drop



Gives a flash-free finish in far less time, at far less cost. On plastic as well as rubber components and parts. CO_2 tumbling is the efficient, *automatic* way to remove flashing and rind. Ends expensive hand trimming—frees labor for more important work.

Prove it? We'll be happy to. A Liquid Carbonic CO_2 tumbling expert is ready to give you prompt, personal attention. Complete descriptive literature is also available. Simply send us a letter or card.

CO_2 and Liquid Carbonic know-how are doing a remarkable job in foam rubber and plastics, too. As the world's largest producer, we are ready to supply CO_2 at any pressure desired for the foaming of thermoplastics.

World's Largest Producer of

THE LIQUID CARBONIC CORPORATION

3130 South Kedzie Avenue
Chicago 23, Illinois

increased to 118,000,000 pounds annually. The original plant, completed in 1950, was designed to produce 17,000,000 pounds annually of only one grade—High Abrasion Furnace Black. After suitable changes the company later also produced FEF and ISAF grades; the present program will enable it to make the complete range of oil-type reinforcing carbon blacks.

New carbon blacks of United Carbon Co., Charleston, W. Va., U.S.A., are to be made in England, it is learned. United Carbon Black, Ltd., which manufactures black under license from the American concern, and markets the black as Dixie 45 and Kosmos 45, will produce Kosmos 60 and Dixie 60 as well as ISAF and FEF grades, at new plant to be installed at its Swansea works. Production of the HAF blacks is expected to begin in the Spring of 1956.

Pirelli Expansion Plans

Pirelli, Ltd., Burton-on-Trent, for many years affiliated with Wellco-Ro-search, Waynesville, N. C., U.S.A., has started an expansion and modernization program at the Burton-on-Trent factory. The existing buildings, which cover 16 acres, will be extended over 32 acres, to make available greatly increased facilities for the long-term program of developing the company's "Spongease slippers." Euston and Holborn industrial rubber boots, and women's shoes and sandals, as well as to provide for the eventual introduction of new lines of footwear.

Honor Centenarian Ridley

For many years just a vaguely remembered name to a large section of the rubber world, Henry Nicholas Ridley,[1] one of the founders of the plantation rubber industry, occupied the limelight as never before in his long life, when he celebrated his one hundredth birthday in England on December 10, 1955. He was congratulated by the Queen, flooded with telegrams and letters, and received many distinguished visitors; gifts included a check from the Rubber Growers' Association, a silver tea service and tray from official and other admirers in Singapore, and an engraved silver salver from the Rubber Producers' Council, Kuala Lumpur.

[1]See also our Sept., 1955, issue, p. 792.

•

Malaya

Planters Continue Attacks On U.K. Synthetic Imports

The British Government's approval of the importation into Britain of 70,000 tons of synthetic rubber from America during 1956 continued to be severely criticized. Early in December, the chairman of the Rubber Producers' Council, H. A. Campbell, launched an attack in the Legislative Council, when it appeared that what rankled particularly was that Malaya had not been consulted or even informed about the matter, and that it was thought that the import duty on the synthetic might be waived. Mr. Campbell recalled that British imports of synthetic had been 5,000 tons in 1953, about 11,000 tons in 1954, and the estimate for 1955 was 16,000 tons. The imports of 70,000 tons during 1956, which would take $40,000,000 (U. S.) from the hard currency pool of the Sterling area, Mr. Campbell considered most excessive and unfair to the natural rubber industry.

Import Duty Remains

The Economics Minister, Oscar Spencer, was able to state that while protests by the Federal Government had been unavailing to prevent the imports, they had influenced the decision of the British Government not to waive the import duty (10%) on American GR-S type synthetic rubber and also to re-impose the duty on butyl rubber, which had been waived. The imports of 70,000 tons had been sanctioned, it was explained, because they were necessary to improve the competitive position of British manufacturers of rubber goods, particularly of tires, who were being undersold in foreign markets by European manufacturers able to make bigger purchases of synthetic rubber—now so much cheaper than natural rubber.

In England the view seems to be that the disputed 70,000 tons of synthetic rubber constitute only a small part of total world consumption of rubber, and that it really makes little difference where the extra synthetic is consumed. However, as the *Straits Times* pointed out editorially, the amount is a very big slice out of British consumption and forecasts a 25% share for synthetic rubber in the British market in future.

New Emphasis on Old Grievances

Leaders of the rubber industry, mulling over the synthetic rubber imports, recalled other grievances, as taxation and destinational control. Sir John Hay, writing to the *Malay Mail* said:

"We . . . reach the grotesque situation under which the hard currency earnings of a heavily taxed Malayan rubber industry are to be utilized to finance and facilitate the free import of its competing commodity—American synthetic rubber."

He went on to attack the Malayan Government's taxation policy which singles out "one industry for the imposition of what in effect is a graduated scale of surtax from which other industries are free." Until the Malayan Government has plainly shown a disposition to be just in taxation and strongly insistent in requiring equitable treatment for its main product in overseas markets, he adds, the advisability of further investment in Malaya will be open to doubt.

The chairman of Anglo-Asian Rubber Plantations Ltd., speaking at a recent meeting on the same subjects, found that apparently:

"The Malayan and U.K. Governments between them have little regard for the future economic progress of the natural rubber industry for, having taken an excessive proportion of its total income by way of export duty and taxation, it is then decided that encouragement should be given to its main competitor."

In the Legislative Council, representatives of the rubber industry were unanimous in their demand for the abolition of the anti-inflationary cess. They contended that the inflation it was intended to curb had not taken place—on the contrary, more goods were available than money to buy them because the cess had reduced purchasing power of the small holder in particular. They want the $46,000,000 (Straits) already paid into the cess to be refunded so that it can be used for replanting and other purposes.

The economics minister intimated that the matter of the cess might be further discussed. Referring to remarks on the famous 70,000 tons of synthetic rubber, made on the same occasion, he stated that rubber growers must decide what their attitude toward synthetic should be. Circumstances would force them to face synthetic competition, for even if the U.K. market could be made a special preserve for Malayan rubber, the growers would still have to do business with other countries where synthetic was being used. He rather unkindly recalled that for years the natural rubber industry had seemed to desire nothing other than to be able to compete fairly with synthetic, that is with synthetic in private hands and not government controlled.

Replanting Scheme Progresses

The government's replanting scheme for estates has now begun to operate. A board of six members—three, including the chairman, appointed by the High Commissioner in Council, and three by the Rubber Producers' Council—was formed to administer the scheme for estates. The chairman is S. E. Chamier, formerly chairman of the War Damage Commission. Early in January application forms for the grant of $400 per acre were sent to 2,000 estates in the Federation which had started replanting or new planting in 1953 and 1954. Estates seeking the grants must satisfy the administrators that they are using approved high-yielding rubber and following good agricultural practice.

•

Netherlands

The laboratories of the Rubber Foundation of Delft, Netherlands, are after all not to be transferred to Indonesia, at least not for the present. The new Indonesian Government apparently saw more clearly than its predecessor the difficulties in the way of such a move and decided that only the Foundation's headquarters are to be removed to Bogor, Indonesia.

CYANAMID RUBBER Chem Lines

NO. 3 OF A SERIES

Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

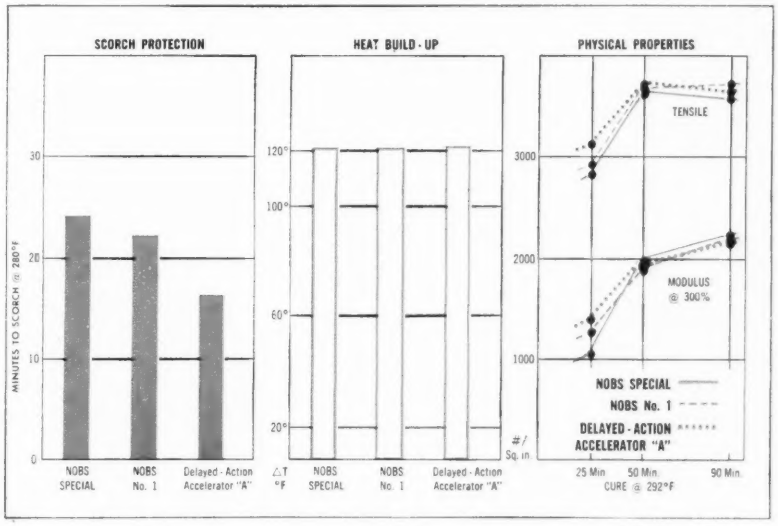


FIG. 1 FIG. 2 FIG. 3

The scorch protection imparted to rubber stocks by the NOBS* accelerators—with no sacrifice of desirable physical properties—is shown in these comparison charts. Both NOBS No. 1 and NOBS SPECIAL accelerators provide excellent physical characteristics at optimum cure.

Burnt Stock is on the Decline

"We achieved a fifty per cent reduction in burnt stock during the past year..." "January brought a record low in scorched stock."

Such statements are not uncommon among users of NOBS* No. 1 and NOBS* SPECIAL, the newest and finest delayed-action accelerators. In addition, users are achieving better mold flow, excellent dispersion, easy handling of these free-flowing materials, and a marked reduction in dust in the millroom and compounding room.

The need for top-speed runs of stocks through existing processing equipment to meet production schedules has accentuated the demand for safe, scorch-free compounds. Also, the widespread use of fine furnace blacks and tougher, more resilient polymers to produce better tire treads have further emphasized the need for accelerators that help prevent scorching. The NOBS delayed-action accelerators meet both of these requirements without sacrificing desirable properties in the processed stock. (See Figs. 1, 2, 3)

To fill the growing demand for these chemical accelerators, additional production facilities have been added to our new plant.

Both NOBS No. 1 and NOBS SPECIAL are particularly recommended for tire treads and molded products containing substantial amounts of high pH furnace black. Also stocks for floor tiles, heels, soles, wire insulation and the like can benefit from their use.

*Trade-mark

Synthetic "Tree" Rubber—A Research Triumph

One of the most significant advancements in rubber research was achieved recently by scientists who developed the new synthetic "tree" rubber. Their achievement climaxed years of research, intensive testing and finally pilot-plant production to prove the practicability of this rubber.

Regarded as a "complete replacement" for natural rubber from a practical standpoint, the new rubber is described as superior to natural rubber in its resistance to cracking, to attack by oxygen and to heat. In its low heat build-up it is essentially identical in character with natural rubber, and its ability to retain its strength at high temperatures makes it ideal for truck tire service.

For years, rubber chemists and other scientists have struggled to develop a synthetic rubber suitable for high-speed truck tires. The GR-S type was found to be unsatisfactory for many truck tire sizes, especially since trucks often run with heavy loads for long distances, causing tremendous heat build-up.

Made from isoprene by polymerization, the new synthetic requires the same accelerators and vulcanizing agents as for GR-S stocks, also the same types of reinforcing agents and softeners. And because it breaks down much more easily than GR-S, the amount of softeners and plasticizers used is generally less – about equal to that for natural rubber.

The developers of this new synthetic have placed their patent rights and research data at the disposal of the government and the entire industry. Coming at a time when the synthetic rubber industry has only recently been removed from government control, this new development is a prime example of the tremendous forward strides possible for an industry free to move on its own.

SPEEDHEATERS... Gas, steam and hot water types. Ideal for uniform space heating with rapid air circulation.
INDUSTRIAL HEATERS... The steam unit heater for industrial plants, warehouses, garages... floor, wall, and ceiling mounting, adjustable nozzle outlets.
SILENTVANE FANS... Non-overloading horsepower characteristics with stable, quiet operation.
STEAM HEATING COILS... Standard and double tube non-ferrous ... also heavy duty wrought iron.
VENT SETS... Direct-connected or V-belt driven ... compact for outdoor or indoor installation.
AIR HANDLING UNITS... Contain all components necessary for "package" heating, ventilating and air conditioning.

*No. 1 of a Series

Put Air to Work Economically for:

*1. HEATING AND VENTILATING
2. Fume, vapor and dust exhaust
3. Make-up air for balanced ventilation
4. Cooling and dehumidifying
5. Electronic Air Cleaning
6. Mechanical Draft for Steam Boilers

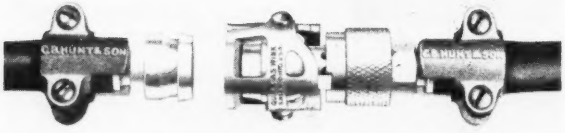
For complete application service, call your Consulting Engineer or your nearest Sturtevant Division Sales Engineer . . . or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 10 B, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80456

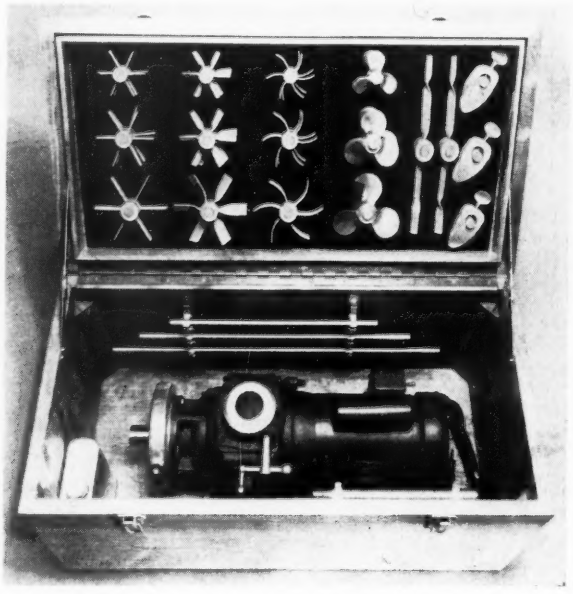
NEW EQUIPMENT



Quick-As-Wink valve coupling

Tool Air-Hose Valve Coupling

Valve couplings for tool-operating air hose that can be adjusted to keep the air trapped in the line, when the tool must be changed, has been introduced by C. B. Hunt & Son, Inc., Salem, O. Called Quick-As-Wink valve couplings, they have a knurled brass sleeve that may be turned to an "on" or to an "off and exhaust" position as required. A locking device prevents the accidental moving of the sleeve. The couplings are designed for line air up to 250 psi., and are manufactured in ¼-, ⅜-, ½-, and ¾-inch sizes.

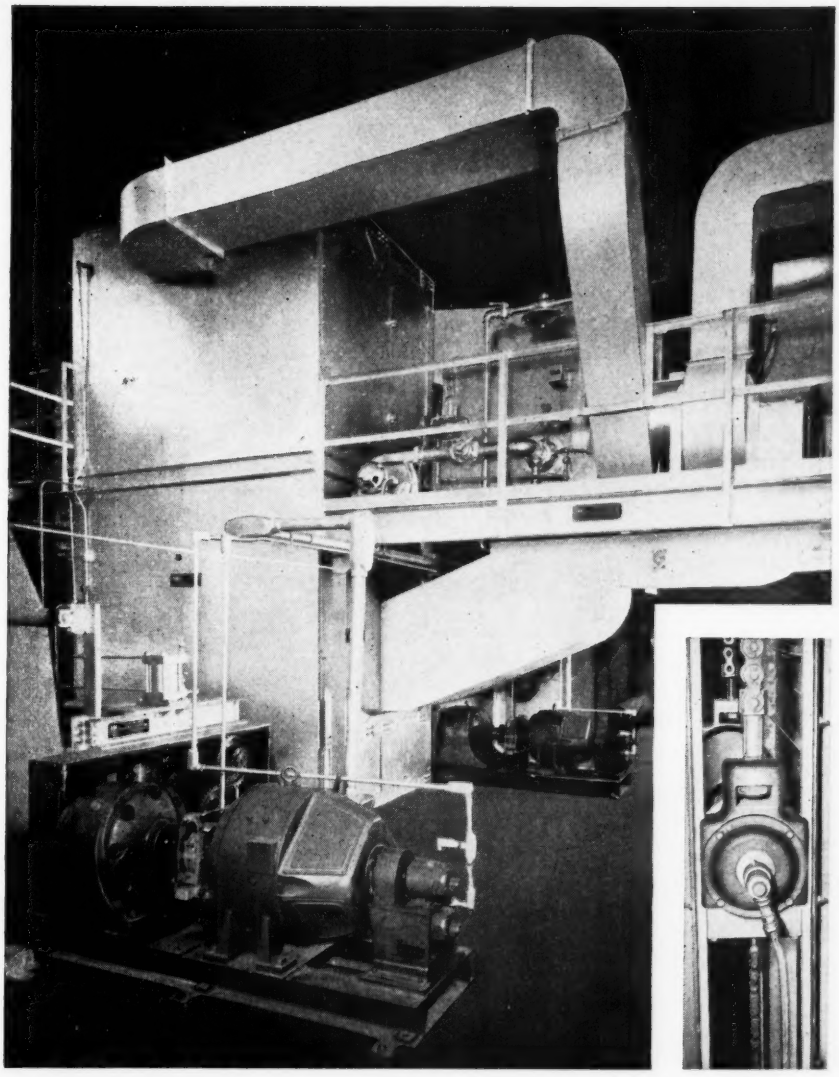


Model ELB experimental agitator and kit

Forty-Pound Agitator and Impeller Kit

A 40-pound agitator for laboratory or small-scale pilot-plant mixing operations has been placed on the market by Chemineer, Inc., Dayton, O. Called Model ELB experimental agitator, it has a ¼-hp. enclosed standard motor for operation on single phase AC, 115 or 230 volts, and a speed transmission variable up to 1100 rpm. The agitator is supplied in a wooden kit containing 22 small-scale replicas of commercial impellers to cover a full range of fluid regimes, and a handbook reviewing the fundamentals of fluid agitation and scale-up factors, charts, and graphs.

According to Chemineer, the Model ELB achieves small-scale fluid agitation without the loss of geometric, kinematic, or dynamic similitudes.



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, at *any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

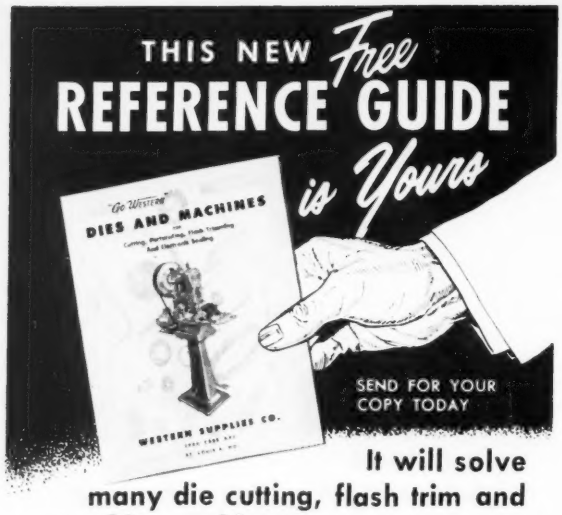
The IOI Rollevator® Oven* is the answer to more uniform hot stretching of nylon with greater production efficiency. Simple and automatic in operation, it practically eliminates costly shutdown and repair time. When the line is stopped the Rollevator® roll automatically lowers out of the heat zone, eliminating the need for quick cool purging of the oven and the time and expense involved in reheating the oven when starting up again. Its low operating cost combined with low initial cost assures you of lower production cost. An IOI sales engineer will be glad to give you complete information about the Rollevator® Oven* and to discuss your requirements for any system from 3 to 100 yards per minute.

®Trade Mark Registered
*Pat. Applied For

INDUSTRIAL OVENS, INC.

IOI ENGINEERING VERSATILITY

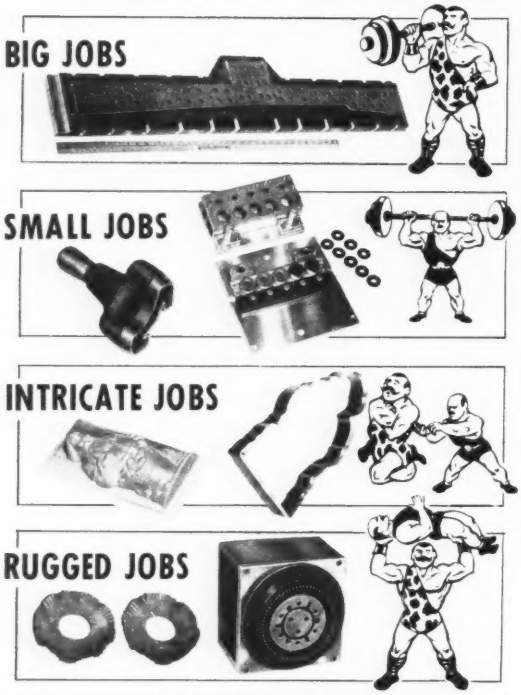
13813 TRISKETT ROAD CLEVELAND 11, OHIO



It will solve many die cutting, flash trim and punching problems

Over 30 years experience—old-timer die makers and capable young engineers—modern machine shop equipment—plus only the best materials. That's what goes into every Western die and machine. Our central location enables us to quote competitively wherever your plant may be. Plastic, rubber and allied industries *"all over the world"* are using Western dies and machines.

"GO WESTERN" for a die to do the:



WE MAKE DIES FROM PATTERNS, BLUE PRINTS OR SAMPLES

FILL IN BLANK AND ATTACH TO YOUR LETTERHEAD

Please send.....FREE copies of Western's New "REFERENCE GUIDE." (Indicate how many copies desired.)

Name.....

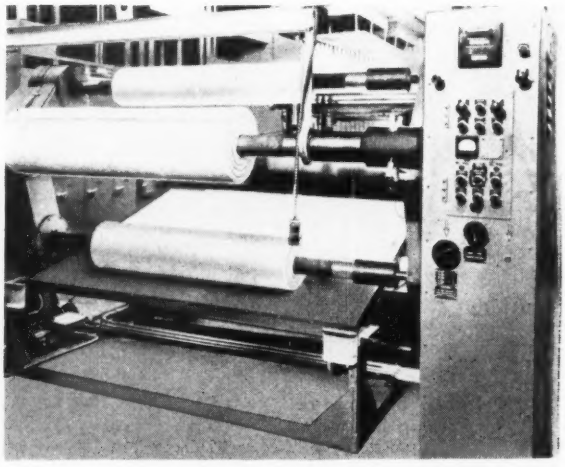
Title.....

WESTERN SUPPLIES *Company*
2922 CASS AVE., SAINT LOUIS 6, MO.

Reichert Optical Works' Neozet Microscope

Austrian Research Microscope

A microscope with such features as built-in illumination, rotatable binocular and monocular observation tubes, universal condenser, and automatic magnification changers has been made available by Reichert Optical Works, Vienna, Austria, through William J. Hacker & Co., Inc., New York, N. Y. Called Neozet, the microscope also includes low-positioned controls, dual coaxially disposed coarse and fine focusing motions, and a device to compensate for any variation in the thickness of object slides.



Hobbs-Alquist 3-shaft turret winder

Three-Shaft Turret Winder

A three-shaft turret winder for in-line continuous production has been made available by Hobbs Mfg. Co., Worcester, Mass. Called Hobbs-Alquist 3-shaft turret winder, the machine is designed to take a web from a previous continuous process and wind it continuously under controlled tension to rolls of a predetermined diameter, up to 36 inches, according to the company. The continuous operation feature is said to reduce winding costs since there is no production loss during change-over. Uniformity of tension eliminates web distortion, thus increasing the salability of the finished rolls. All three of the machine's arbors can be electrically clutched to the same controlled-tension drive.

A brochure describing the equipment is available from the company at 332 Salisbury St., Worcester 5.

Production Analyzer for Rubber, Plastics

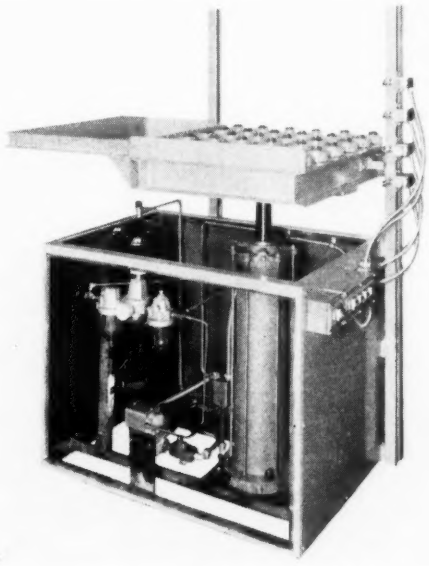
A production analyzer, which, when used in conjunction with the company's beta gages for thickness measuring and its automatic control console, is said to give a continuous record of production for a wide variety of materials, including rubber and plastics, has been introduced by Tracerlab, Inc., Boston, Mass. The panel of the analyzer has registrations in five categories of tolerances. Production may be registered in any customary unit of length. No computations need be made.

Bimetallic Dial Thermometer

A new bimetallic dial thermometer for a wide variety of industrial and institutional applications, such as pipe lines, storage tanks, ovens, air ducts, and sterilizers, has been introduced by Taylor Instrument Co., Rochester, N. Y. Dubbed Bi-Therm Dial Thermometer, it is available with three- or five-inch dials and is said to be rugged in construction, waterproof, corrosion-resistant, and silicone-damped against vibrations. A 1% accuracy is claimed for the instrument. Separable wells of brass, steel, stainless steel, or Monel are available.

The Bi-Therm is made in different temperature ranges, from a low of −40 to a high of 750° F.

Bulletin 98267, describing the thermometer and its operation is available free from the company.



Loomis Model 130 loading table

Automatic Elevating Loading Table

A push-button operated elevating loading table for loading and unloading a multiple-opening press has been placed on the market by Loomis Engineering & Mfg. Co., Newark, N. J. Designated Model 130, the air-powered unit has a table which is raised or lowered to any one of two or more preselected press-opening levels by push-button.

Plain or ball transfer table tops are available. The unit comes in a variety of sizes and load ratings.

Precision-Interchemical Rotational Viscometer

A high-speed, wide-range instrument for determining the viscosity, yield value, and thixotropic breakdown of highly viscous materials, such as rubber, adhesives, plastics, paints, and greases, has been placed on the market by Precision Scientific Co., Chicago, Ill. Called Precision-Interchemical rotational viscometer, the device determines plastic viscosities from one to 2,500 poises and yield values up to 180,000 dynes/cm^2.

A sample bath provides temperature control from 20 to 100° C. A variable-speed rotation cup permits up to 40 speed changes within three minutes, providing quick, easy plotting of the needed calibration curve, the company says. An electronic motor drive assures constant-speed rotation at any setting.

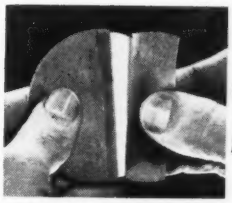
Overall dimensions of the rotation viscometer are: depth, 2$^{3}/_{12}$ feet; height, 5¼ feet; and width, 2$^{5}/_{6}$ feet. Weight is 710 pounds.

New PATAPAR®
RELEASING PARCHMENTS

Easy release
from pressure sensitive and tacky surfaces

These new types of Patapar Vegetable Parchment give you a LOW COST "release" material that peels off easily from all kinds of tacky surfaces and pressure sensitive adhesives. Excellent as a backing, liner, interleaver, overwrap or separator sheet.

Features of the new Patapars include: *dense, fibre free texture, high resistance to penetration or migration of oil and softeners, permanent releasing action.*



Ideal backing for pressure sensitive surfaces

Separator for rubber tape — just the right releasing action.

SEND FOR SAMPLES

Tell us the application you have in mind and we will send testing samples and technical data.

Patapar® Vegetable Parchment
HI-WET-STRENGTH · GREASE-RESISTING

PATERSON PARCHMENT PAPER COMPANY
Bristol, Pennsylvania
Sales Offices: New York, Chicago
West Coast Plant: Sunnyvale, California

HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885

now available...

POLYISOBUTYLENE DISPERSION 108

a stable, aqueous dispersion of VISTANEX*. The product is unloaded and yields a colorless, tacky film when the moisture is removed. VISTANEX is widely known for its stability, resistance to aging and chemical inertness. The VISTANEX dispersion is compatible with natural and synthetic latex.

*Trade Mark, Enjay Company, Inc.

SUGGESTED USES

1. Pressure sensitive adhesives
2. Tackifier and binder
3. Protective coatings
4. Sealing compounds
5. Additive for latex compounding
6. Modifier for dextrine, gums and starches
7. Textile coatings
8. Textile laminating
9. Adhesives for flock printing
10. Binder for cellulose, textile and leather fibers.

SPECIFICATIONS and PROPERTIES

Appearance
Milky white liquid

Solids
55% ± 1.5%

pH
10-11

Specific Gravity
0.97 approximately

Coagulum
0.5 max. retained in 60 mesh

Viscosity
Medium

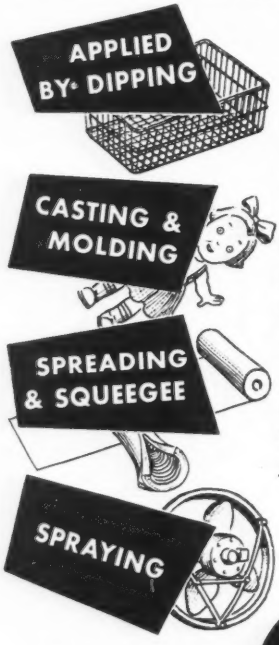
For complete technical data and sample, send to

M-S MILLER-STEPHENSON CHEMICAL CO., INC.

550 Fifth Avenue, New York 36, N. Y.

PYROXCOTE

PLASTISOLS and ORGANOSOLS



Pyroxcote Plastisols and Organosols are the ENGINEERED vinyl dispersions. They are the best answer to many a difficult finishing problem.

Pyroxcote Plastisols are applied by dipping, casting, spraying, and spreading—are fused by subsequent heating to yield plastic coatings which may be thick or thin—colored or colorless—dense or porous—"engineered" to your particular needs.

It will pay you well to drop us a line for helpful advice on your special needs.

PAOLI, PENNA.

Pyroxylin PRODUCTS, INC., CHICAGO 32

*T.M. Reg. U.S. Pat. Off.

NEW MATERIALS

Panarez 3-290 and 6-290 Hydrocarbon Resins

Two new hydrocarbon resins for use in rubber compounding as softeners and extenders where a high softening point is desirable have been added to the line of Pan American Chemicals Corp., New York, N. Y. Called Panarez 3-290 and Panarez 6-290, they are said to be light colored, neutral, and non-saponifiable resins with excellent electrical characteristics and good resistance to water, alkali, and alcohol. Both have softening points of 280-300° F.

Some typical tests of the two resins are as follows:

	Panarez 3-290	Panarez 6-290
Specific gravity, 60/60° F.	1.034	1.110
Color, Gardner—1933	12	12
Weight, lbs./gal.	8.61	9.246
Iodine number, Wijs	220	156
Softening point, °F, ASTM	290	290

"Elastex" 20-A Plasticizer for Vinyls

A diisodecyl adipate low-temperature plasticizer for vinyl formulations has been put into commercial production by Barrett Division, Allied Chemical & Dye Corp., New York, N. Y. Called "Elastex" 20-A Plasticizer, it is said to combine low volatility with good resistance to heat degradation compared to such adipate plasticizers as dioctyl adipate, which has twice the volatility of the diisodecyl adipate.

"Elastex" 20-A is normally available with added antioxidant, which may, on request, be varied in proportion or eliminated entirely.

Some reported typical properties of "Elastex" 20-A Plasticizer follow:

Color, Hazen	35 max.
Specific gravity, 20/20° C.	0.916-0.922
Surface tension @ 25° C., dynes/cm.	33.6
Viscosity, centipoises @ 5° C., Brookfield	51
@ 25° C.	21
50° C.	10
80° C.	5
Pour point, ° C.	—55
Weight loss, 72 hr. @ 82° C., %	0.07
2 hr. @ 175° C., %	1.2

Technical data report C-5513, describing "Elastex" 20-A Plasticizer and giving test data for three typical vinyl formulations employing it, is available from the company.

"Plaskon" Polyethylene Lubricants

A series of white, tasteless, and non-toxic low molecular weight polyethlyene lubricants for the production of natural and synthetic rubber goods also has been made available by Barrett. "Plaskon" lubricants are added to the compound and are said to disperse readily, have high compatibility, do not bloom or interfere with ply adhesion, and are non-staining. Suggested uses include: detackifying and mold release; as processing aid to improve filler and pigment dispersion; for increasing calendering and extruding rates; and to provide chemical and electrical resistance.

Available are "Plaskon" 8406 and 8407, extruded materials; "Plaskon" 8416 and 8417, powdered; and "Plaskon" 8429, a special oxidized emulsifiable grade.

Some reported typical physical properties of "Plaskon" include the following:

Grade	8406. 8416	8407, 8417	8429
Average molecular weight	2,000	1,500	2,000
Melting point, °C.	99.5	89	97
Penetration, mm. (100 g., 5 sec., @ 25° C.)	0.4	2.25	3.0
Specific gravity @ 25° C.	0.92	0.92	0.93
Viscosity @ 140° C., Saybolt Furol sec.	185	69	45

Technical Data Reports C-557, C-559, C-5510, and C-5512, describing the materials, are available from the Barrett Division.

Low-Volatility Cabflex HS-10 Plasticizer

What is called the first low-volatility phthalate plasticizer to offer excellent processing characteristics has been made commercially available by Godfrey L. Cabot, Inc., Boston, Mass. Called Cabflex HS-10, the alkyl aryl phthalate is said to have half the volatility of di-decyl phthalate, lower than any other phthalate plasticizer on the market. Cabflex HS-10 is also said to have high stability and permanence, to require no antioxidant, to have excellent electrical properties and high resistance to oxidation and heat breakdown, to resist extraction by gasoline, oil, and water, and to exhibit a low rate of migration. This new plasticizer is compatible with polystyrene, polyvinyl chloride, polyvinyl chloride acetate, and many other resins.

Selenide-Replacing Mercadium Reds

A red chemical pigment for the rubber and plastics industries that was developed to replace cadmium sulfo-selenide reds, in limited supply because of the selenium shortage, has been made available by Imperial Paper & Color Corp., Glens Falls, N. Y. Called Mercadium reds, indicating their derivation from the sulfides of cadmium and mercury, the pigments are said to be the equal of the selenide colors in such qualities as excellent permanency to light in masstone, good tint permanency, non-bleeding, high opacity, and resistance to alkalies, acids, and heat. These reds are an improvement over the selenides in their brighter masstone hues, cleaner tints, and greater tinting strength, according to the company. Six shades of red are available.

Polymerizing Dispersant for Vinyls—Monomer MG-1

A high-boiling, low-viscosity monomer that acts as an efficient dispersant for vinyl chloride dispersion-type resins, but polymerizes during fusion of the resin to a hard resinous material which retains no plasticizing action has been developed by Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. Called Monomer MG-1, the material, a difunctional ester, is said to make possible the production of vinyl plastics with any degree of hardness by plastisol techniques.

Other suggested uses for the material include the production of new polymers and copolymers through copolymerization with styrene, vinyl chloride, vinyl acetate, acrylates, and other monomers; as an impregnant for paper, leather, and similar materials, since it can be polymerized in place; and in calendering, extrusion, and other hot-processing techniques.

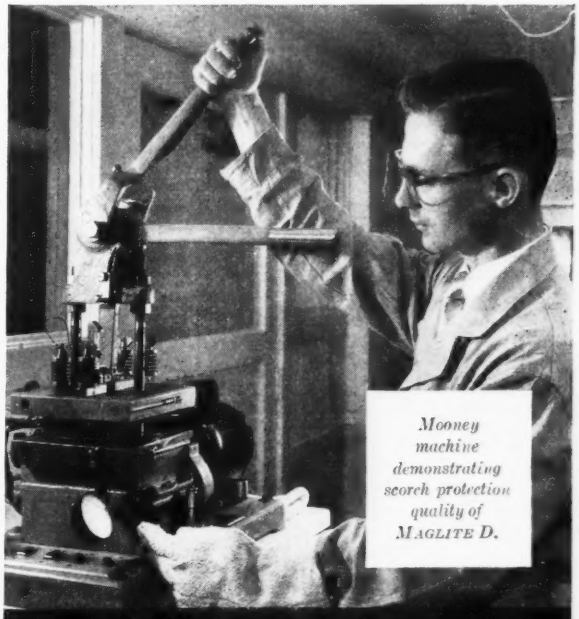
Reported physical properties of Monomer MG-1 include:

Viscosity @ 25° C., centipoises	12.2
Specific gravity, 25°/20° C.	1.078
Color, Gardner	3.0
Refractive index @ 30° C.	1.459
Average weight per gal. @ 25° C., lbs.	8.5

Technical data sheet F-8794, describing the material and its uses, may be obtained from the company on request.

MAGLITE®

The Performance-Proved Brand of Magnesium Oxide



Mooney machine demonstrating scorch protection quality of MAGLITE D.

Ideal for Compounding Neoprene, Hypalon®, Butyl, Nitrile, Natural, and GR-S Rubbers

Uniformity of chemical and physical characteristics, high scorch protection, and ease of dispersion are desirable characteristics you can always count on when you specify the MAGLITE brand. These products are available as MAGLITE M, an extra-light magnesium oxide, and MAGLITE D, a dense compound for minimum storage space.

Merck's basic *magnesium carbonate* is another fine product you can depend on. As a filler and reinforcing agent, it provides unexcelled uniformity and quality.

To assist you in overcoming compounding problems, the Marine Magnesium Division maintains a pioneering rubber laboratory devoted to research and technical service on magnesium products.

Stocks are quickly available from 15 warehouses strategically located throughout the country.

Distributors:

G. S. ROBINS & CO. • WHITTAKER, CLARK & DANIELS, INC. • THE C. P. HALL CO.

MERCK & CO., INC.
Marine Magnesium Division

RAHWAY, NEW JERSEY SOUTH SAN FRANCISCO, CALIFORNIA

VULCANIZED VEGETABLE OILS

rubber substitutes

THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

A long established and proven product

THE CARTER BELL MFG. CO.
SPRINGFIELD, NEW JERSEY

Represented by
HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Chicago, Los Angeles, Trenton, Albertville, (Ala.), Denver

NEW PRODUCTS

Goodyear Steel-Grip Ice Tire

A snow-and-ice truck tire with a steel-wire tread construction has been placed on the market by The Goodyear Tire & Rubber Co., Akron, O. Called Steel Grip, the tire is said to provide maximum grip on all slick highways because of the wire tread construction and the wave-like design of the tread. The tire also resists cuts, resulting in a higher percentage of recappable carcasses, according to the company. A range of highway sizes is available.

Goodyear Light Truck Tire

Another new truck tire, this one a replacement tire for lightweight delivery trucks and similar vehicles, also has been announced by Goodyear. This Hi-Miler has the flat tread of the Hi-Miler line and a tire body designed for a maximum number of retreads according to the company. New, tougher rubber compounds are said to have been used in construction. One size is made—6.70-15.

Goodyear Colored Bike Tires

Bicycle tires with red, blue, or green treads, all with white sidewalls, have also been developed by Goodyear, for incorporation into its Wingfoot and G-3 All Weather bicycle tire lines. The colored Wingfoot tires come in sizes 26 x 1.75, 24 x 1.75, and 20 x 1.75. Sizes for the G-3 are 26 x 2.125, 24 x 2.125, and 20 x 2.125.

Replacement Tubeless Passenger Tires

A new line of replacement tubeless passenger tires, priced about 25% below original equipment tubeless tires, is from Goodyear. Designated Super-Cushion tubeless, the tire line resembles the company's Super-Cushion tubed tires in such features as tread design and cord construction.

Goodyear Tubeless Hi-Miler Rib

A tubeless small truck tire for 15- and 16-inch wheels is another Goodyear product. Known as Tubeless Hi-Miler Rib, the tire has all the features of the company's tube-type Hi-Miler Rib and will fit present full drop-center rims. The tire is available in sizes 6.00-16, 6.50-16, 7.00-15, and 7.00-16, all six-ply rating.

Dayton Synthetic Rubber Roller

A synthetic rubber roller for use in electrolytic tinplate lines for manufacturing cans and in lines for cleaning and annealing steel has been placed on the market by The Dayton Rubber Co., Dayton, O. According to the company, the roller's porous construction gives it more edge and greater resistance to glazing. Rollers are available up to 43 inches in diameter.

Neoprene Drain-Clearing Device

A neoprene plumbing device that clears sewer and toilet drain stoppages has been introduced by Midwest Rubber Co., East Detroit, Mich. Called Miruco Jet Flush, it consists of a flexible neoprene bag that is attachable at one end to an ordinary garden hose and is inserted into the clogged drain. With the onrush of water through the hose, the bag inflates to a tight seal in the drain, and the continuing stream of water forces the drain free.

Midwest Rubber Co.'s Miruco Jet Flush

The device has brass fittings and an adjustable nozzle for variations in water pressure.

Goodrich Tread-Coated Truck Tubeless

A tubeless truck tire that has a protective coating on its tread and in its tread contours, said to prevent cracking and checking, has been placed on the market by The B. F. Goodrich Co. Tire & Equipment Division, Akron, O. Dubbed Power Express tubeless, the tire also has an inner coating of Hycar 2202 to improve air-retention qualities. The design of the tread includes notched ribs for increased traction. Built to meet tubeless tire and rim assembly measurements as standardized by The Tire & Rim Association, the tire is available for both original equipment and for replacement use, with sizes ranging from 6.00-16 6-ply through 11.00-24 12-ply.

Naugahyde Line Additions

Two new patterns and a new finish in its Elastic Naugahyde upholstery line, and a new pattern in its Breathable Naugahyde, are being offered by United States Rubber Co., New York, N. Y. The two new patterns of Elastic Naugahyde are Polynesian, in 10 colors, and Pebble, in six colors. The new finish is Glazed Antique, in 20 colors and two weights, 27 and 40 ounces. The new Breathable Naugahyde pattern is Pylon, which is available in 12 colors.

Firestone Front Tractor Tire

A front tractor tire that is said to give up to 60% longer wear than any other front tractor tire on the market is available from The Firestone Tire & Rubber Co., Akron, O. Called Guide Grip, the tire has a mud guard, or deflector strip, extending above the rim flange, protecting the sidewall and beads. Other advantages claimed for the tire include better steering and shorter turning, improved cleaning in all types of soil conditions, and greater resistance to impact breaks because of the gum-dipped cord body.

Firestone Tubeless Snow Tire

What is called the first silent-running snow-and-ice tire that is tubeless has also been introduced by Firestone Company.

Dubbed Town & Country, this new tire has a wide, flat tread which is claimed to provide greater mileage and a tread design that is said virtually to eliminate tire whine. The tire is available in either black or white sidewalls and with nylon or rayon cord.

Conveyor Belt with Nitrile Rubber Cover

A conveyor belt made with a nitrile rubber cover whose resistance to vegetable and animal oils and fats is said to make it ideal for use in food processing plants, feed mills, and textile mills has been placed on the market by Hewitt-Robins, Inc., Stamford, Conn. Called Hewlite, this belt is made in four plies, in widths up to 48 inches, and in either a smooth or rough surface for horizontal or inclined haulage. The belt's cover will not swell even after long service, the company says.

HOBBS ALQUIST

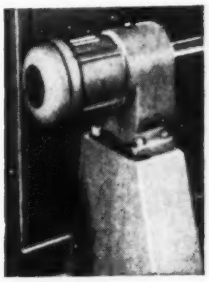
Web Winders Winding Engineering

1. REGULAR —for general winding applications
2. WITH DIFFERENTIAL —for unwinding application where constant tension is a factor
3. WITH SYNCHRONIZATION —for utilizing tension control regardless of process speed
4. SINGLE STRAND WINDER —for winding from central source to individual spools
5. AUTOMATIC PROGRESSIVE FRICTION —for automatic tension control direct from the web utilizing a series of overriding slip friction clutches
6. CUSTOM BUILT EQUIPMENT —winding and unwinding reels, stands with special attachments and companion equipment

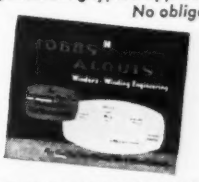
An Engineering Plan For Whatever You Wind or Unwind

Hobbs-Alquist Winding Engineering solves every winding or unwinding problem throughout your plant — in terms of the exact demands of each individual process whether it involves constant tension, variable tension or any combination of tensions.

Our regular Hobbs-Alquist shown here is designed for rewinding applications—including extruding, coating, sensitive plastic printing operations. Also especially adaptable in textile finishing operations.



Send for special brochure giving details of Hobbs-Alquist Winding Engineering, showing versatility of Hobbs-Alquist Winders, illustrating typical applications. No obligation.



EST. 1882 HOBBS MANUFACTURING CO.
68 Salisbury St., Worcester 5, Mass.

N.Y. Area Off., 821 Eighteenth Ave., Irvington 11, N.J.
Chicago Office at 549 W. Wash. Blvd.
CANADIAN REPRESENTATIVE:
The E. V. Larson Co., 572 Queen St. East, Toronto 2, Canada
Hand & Power Shears • Die Presses • Slitters & Re-Winders • Corner Cutters

The Institution of the Rubber Industry

LONDON

The I.R.I., which was founded in 1921, is now a great association of people engaged in all branches of the Rubber Industry. Its members include rubber producers, manufacturers, scientists, technologists, executives, students and others, in many countries of the world.

It has reached its present position of authority and respect through the high standard it has set for the technical literature it publishes, the diplomas it awards, and the meetings and conferences it organizes.

In collaboration with other Societies, it aims to raise the standing of the Industry throughout the world by improving the technical qualifications of its personnel, extending the study of its raw materials, processes, and products, and by promoting the exchange of technical discovery and information by means of literature, conferences, and meetings.

Membership of the Institution is open to all interested at an annual subscription of $7.50 which entitles the member to receive the bimonthly Transactions free of charge and to purchase other publications (such as the Annual Reports and Monographs) at reduced rates. It also serves to put him in touch with his colleagues and their work in other parts of the world and confers on him full rights to vote, to nomination for election to the Council and to participate in meetings and Conferences organized by the Institution.

Complete details are easily obtained by writing to:

SECRETARY
INSTITUTION OF THE RUBBER INDUSTRY
4, KENSINGTON PALACE GARDENS
LONDON, W. 8, ENGLAND

TECHNICAL BOOKS

BOOK REVIEWS

"Practical Latex Work." H. J. Stern. With foreword by Royce J. Noble. The Blackfriars Press, Ltd., Leicester, England. Third edition, 1955. Available in U.S.A. from RUBBER WORLD. Board cover, 4¾ by 7¼ inches, 96 pages, illustrated. Price, $2.50.

The publication of a third edition testifies to the substantial demand that exists for a book such as Dr. Stern's "Practical Latex Work." It is a very highly compressed handbook of latex practice, for in its 96 pages almost every industrial application of latex is outlined. When a compound is mentioned, the exact weights of the ingredients are listed; when a process is described, precise times and temperatures are given.

The reasons for the various compounding steps taken, however, and the theories behind the processes described are entirely omitted. As a consequence, some readers may feel that latex product manufacturing is thereby reduced to the do-it-yourself or cook-book level.

A number of specific criticisms might also be made. The dipping process appears to have been overemphasized. The discussion of synthetic rubber latices is quite limited and lacks the precise instructions found in the other parts of the book, but this is not unexpected in a book published in England at the present time. A method for decreasing the ammonia content of latex by the use of formaldehyde (page 35) is poorly explained. Creamed latex as well as centrifuged is now transported in bulk (page 10) and much of the former is sold at 68% solids content.

These criticisms, however, concern only a minor fraction of a volume that is packed with facts. For the reader who needs a brief and modern description of latex technology, this book should be very worthwhile.

P. D. BRASS

"Instruments for Measurement and Control." Werner G. Holzbock. Reinhold Publishing Corp., 430 Park Ave. New York 22, N. Y. Cloth, 6 by 9 inches, 376 pages. Price, $10.00.

This book describes and illustrates all of the more recent devices used to measure and control temperature, moisture, pressure, flow, liquid level, density, viscosity, and speed. Written in non-mathematical language, it is intended as a reference work for researchers in the fields of instrumentation and quality control.

Eight chapters are devoted to the instruments mentioned above, and other chapters cover such topics as material specification analysis, automatic controller action, electric controllers, self-operated controllers, time function controllers, and final-control elements. A special chapter on trends discusses the development of centralized systems, miniaturization, and digital computers.

Schematic reproductions of all types of instruments are included.

Technicians not directly concerned with instrumentation should find this book useful as a review of physial elements.

NEW PUBLICATIONS

"Techniques." Barnes Engineering Co., Stamford, Conn. 12 pages. This first issue of a publication devoted to new developments in automation equipment, infrared components and systems, and process control instrumentation features a description of Binotrol, the company's punched-tape control system that has been applied to the turret lathe and to other types of industrial equipment. Other articles concern radiometers and an automatic assembly machine dubbed Multra.

Publications of Dow Corning Corp., Midland, Mich.

"Silastic Facts." Dow Corning Corp., Midland, Mich.

"RTV Silastic S-5313 and S-5314." Reference 9-218. 1 page. Characteristics and postcure properties of RTV Silastic, two-component mix, applicable for dipping and pouring, which may be vulcanized at room temperature, are included in this report.

"Silastic 50." Reference 9-360. 2 pages. Typical properties, postcure properties, and applications of this general-purpose high tensile, high elongation stock are contained in these data sheets.

"Silastic 80." Reference 9-361. 2 pages. Typical properties, postcure properties, and applications of another general-purpose, high hardness Silastic stock are described.

"Silastic 125." Reference 9-364. 2 pages. Properties of this low-consistency silicone rubber paste, useful in a variety of coating and calking applications, are enumerated.

"Silastic 6-127." Reference 9-363. 2 pages. Properties of this completely compounded cloth-coating silicone rubber paste, serviceable at temperatures from —100 to 500°F., are reported.

"Silastic." 4 pages. Physical, chemical, and electrical data on Silastic are included in this illustrated brochure.

"Silastic Notebook Contents." November 1, 1955.

"Silicone Notes." Reference 4-609. 1 page. The properties of the firm's A-4014 Primer, an air-dry material that is said to improve markedly the bond between RTV Silastic and plastic or metal surfaces, are given here, together with methods of application.

"Physical Properties of Synthetic Organic Chemicals." F-6136. 24 pages. Chemical formulae, properties, and uses of more than 300 of the company's synthetic organic chemicals, among them alcohols and glycols, esters, aldehydes and ketones, ethers, anhydrides, plasticizers, and nitrogen and aryl compounds, are listed in this catalog.

"1956 Reference Guide to Dow Corning Silicone Products." Reference No. 1-110. 12 pages. This guide describes and gives specifications and uses for 150 of the company's silicone fluids, compounds, greases, resins, and rubbers.

Publications of Naugatuck Chemical, Division of United States Rubber Co., Naugatuck, Conn.:

"Compounding for Insulated Wire and Cable." C. W. Lawson, Compounding Report No. 37. 32 pages. Recipes for compounding natural rubber, GR-S, neoprene, butyl, and mixed-polymer insulation for wire and cable are included in this booklet, together with test data before and after aging.

"Marvinol Grade Identification Color Code." 1 page. This chart gives color codes for identifying the type of resin within Marvinol shipping bags.

"Naugatuck Rubber Chemicals." Vol. 1, No. 1. 4 pages. The uses of Polygard, the company's non-discoloring stabilizer for synthetic rubber goods, are described and illustrated in this first issue of a projected series of reports.

"Naugapol." 4 pages. Tabular information on currently available Naugapol synthetic rubbers is presented in this folder.

Publications of The Goodyear Tire & Rubber Co., chemical division, Akron, O., in a "Tech Book Facts" series:

"Compounding with Pliovic DB (Dry Blending) Resins." Bulletin 55-310. 8 pages.

"Formulating with Pliovic DB (Dry Blending) Resins." Bulletin 55-299. 2 pages.

"Dry Blend Ingredients and Suppliers." Bulletin 55-201. 2 pages.

"Processing Pliovic DB (Dry Blending) Resins for Extrusions." Bulletin 55-298. 8 pages.

"Electrical Grade Underwriters' Approved Vinyl Resins Pliovic EDB9OV and Pliovic EG9OV." Bulletin 55-179. 2 pages.

"Compounding with Electrical Grade Pliovic Resins." Bulletin 55-180. 2 pages.

"Formulating with Electrical Grade Pliovic Resins." Bulletin 55-181. 4 pages.

"Processing the Electrical Grade Pliovic Resins." Bulletin 55-182. 2 pages.

"Properties: Plio-Tuf C75 for Calendering." Bulletin 55-192. 2 pages.

"Compounding Plio-Tuf C75 for Calendering." Bulletin 55-194. 2 pages.

"Calendering and Laminating Plio-Tuf." Bulletin 55-193. 4 pages.

Now . . . Up-To-The-Minute

INTERNATIONAL TECHNICAL ASSISTANCE

- To tire and other rubber manufacturers abroad who desire to learn the latest American "Know-How" . . . cut manufacturing costs — we offer comprehensive Technical Assistance at low cost.
- Dayton Rubber's I.T.A. plan has been in existence for 20 years. Rubber experts and teachers who give unexcelled technical assistance at a surprisingly nominal cost . . . all backed by 50 years of recognized leadership in the rubber industry . . . with 4 U. S. plants.
- We train your personnel in these modern plants . . . help you establish the latest formulae for processing natural and all new types of synthetic rubbers and textiles . . . latest "Know-How" in Tubeless Tires, Butyl Tubes, Rayon and Nylon Cords, Carbon Blacks. We also design factories and supervise machinery installations if desired. Write: International Technical Assistance Division, Dayton Rubber Co., Dayton 1, Ohio.

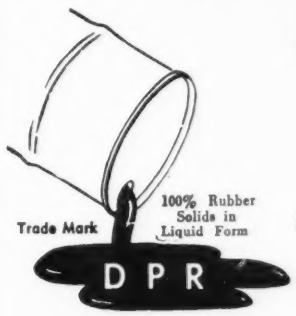
CABLE ADDRESS: THOROBRED

INTERNATIONAL TECHNICAL ASSISTANCE DIVISION I.T.A. THE DAYTON RUBBER CO. DAYTON, OHIO

Dayton Rubber 51 YEARS OF PROGRESS

DPR®

Depolymerized Rubber



AVAILABLE IN HIGH and LOW VISCOSITIES

100% ALL RUBBER SOLIDS

DPR, INCORPORATED
A Subsidiary of H. V. HARDMAN CO.
571 CORTLANDT STREET
BELLEVILLE 9, N. J.

The Important Qualities You Want In MAGNESIUM OXIDE For Rubber or Neoprene Compounding are AVAILABLE in DCI LIGHT CALCINED MAGNESIA

(Powdered or Granular)

REQUIREMENTS

★ MgO with low Fe_2O_3, Al_2O_3 and CaO content

★ Uniformity

★ Controlled Particle Size

★ Dust-free Grains

★ Lowest Manganese Content

★ Protective Packaging

★ These requirements are met completely by Darlington Chemicals Magnesium Oxide. Test and you'll know. Send for free sample today. Specify use.

DARLINGTON CHEMICALS INC.

1420 WALNUT STREET

PHILADELPHIA 2, PA.

Represented by

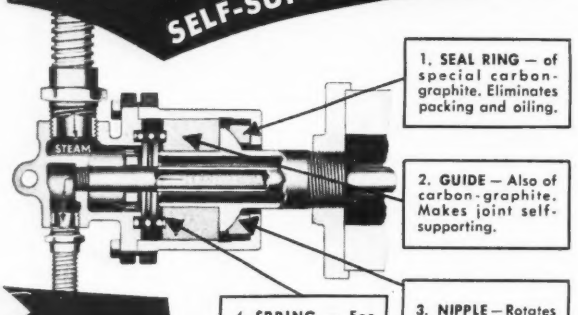
SUMMIT CHEMICAL CO., AKRON, OHIO

TUMPEER CHEMICAL CO., CHICAGO, ILL.

THE B. E. DOUGHERTY CO., LOS ANGELES & SAN FRANCISCO

JOHNSON Rotary Pressure JOINT

SELF-SUPPORTING TYPE


STEAM
1. SEAL RING — of special carbon-graphite. Eliminates packing and oiling.
2. GUIDE — Also of carbon-graphite. Makes joint self-supporting.
3. NIPPLE — Rotates with roll, seals against ring.
4. SPRING — For initial seating only. In operation joint is pressure sealed.

Only 4 Internal Parts

For introducing steam and liquids into rotating rolls and cylinders, there's nothing like the Johnson Joint above. It's packless, self-lubricating, self-adjusting, self-supporting. It has been adopted by dozens of machinery makers, and is finding new uses every day.

Type SB shown handles both steam and condensate through same head; also available for through flow service, and in sizes and styles for all operating conditions. ***Write for literature.***

The Johnson Corporation

869 Wood St., Three Rivers, Mich.

Publications of Wyandotte Chemicals Corp., Wyandotte, Mich., relating to the use of the company's Purecals in compounding latex, dry rubber, and adhesives:

"Viscosities of Aqueous Slurries of Purecal M." Vol. 1, No. 7. 2 pages.

"Preparation of 60% Total Solids Slurry of Purecal M." Vol. 1, No. 8. 1 page.

"Preparation of Purecal M Water Suspensions." Vol. 1, No. 9. 1 page.

"The Use of Purecal SC in General-Purpose Extrusion for Open Steam Curing (ASTM R510)." Vol. 1, No. 10. 1 page.

"The Use of Purecals in 'Hypalon' S-2 (Chlorosulfonated Polyethylene)." Vol. 1, No. 11. 2 pages.

"The Use of Purecals in Polyvinyl Chloride Resins." Vol. 1, No. 12. 1 page.

"Purecal Fillers for Polyester Resins." Vol. 1, No. 13. 3 pages.

"Neoprene Type W Gasket Compounds." Vol. 1, No. 14. 1 page.

"Purecal SC as Zinc Oxide Replacement in Adhesive Compounds." Vol. 1, No. 15. 1 page.

"Symposium on Aging of Rubber. Papers Read at the Spring Meeting of the Swedish Institute of Rubber Technology, Held May 20, 1955." Published by Sveriges Gummitekniska Forening, Stockholm 7, Sweden. 117 pages, including graphs, diagrams, and tables. Price $5.25. This is a collection of the papers read at the meeting held on May 20, 1955, in Karlstad, Sweden, of which one each is in Danish, German, and Swedish, respectively, and the remaining four are in English. Included are: "The Mechanism of Deterioration of Rubber," by Holger Leth-Pedersen (in Danish); "The Significance of Accelerated Aging Tests," G. W. van Raamsdonk (in English); "Improved Methods of Laboratory Aging," L. Bottomley; "The Effect of Antioxidants on Autoxidation in Light," M. Davies and C. E. Kendall; "Antioxidants for Heat Resistance," F. V. Spulak (in German); "Non-Staining Antioxidants," G. E. Williams; "The Aging of Rubber—The Effect of a Number of Conspiring Factors," E. Ganslandt (in Swedish).

"News-Letter." September 1, 1955. Rubatex Products, Inc., New York, N. Y. Two subjects are discussed in this issue of the "News-Letter": variations in milling and mixing of rubber stocks in order to obtain a specific quality of finished product, and simple factory control tests adaptable to the conditions of the mill room.

"Homer Permanent Magnetic Drums." Bulletin MD-200. The Homer Mfg. Co., Inc., Lima, O. 6 pages. Models of the company's magnetic drums for the separation of injurious tramp iron from processed food and chemicals are illustrated and described in this folder.

"Flexaust Hose and Portovent Duct." Bulletin 60. Flexaust Co., New York, N. Y. 6 pages. Description, specifications, and uses of the company's hose and ducts for moving air, dust, fumes, or materials are included in this folder

"Precision High-Temperature Utility Oil and Water Bath." Bulletin 668. Precision Scientific Co., Chicago, Ill. 2 pages. The firm's Hy-Temp aging bath, designed for the rubber and the plastics industry for processing ASTM Methods D471 and D735, is described here.

"Engineering Standards for Multiple V-Belt Drives." Multiple V-Belt Drive & Mechanical Power Transmission Association, Chicago, Ill., and The Rubber Manufacturers Association, Inc., New York, N. Y. 24 pages. Price, $1. This is the revised edition of the manual first issued in 1951; such revision was necessitated by recent technological advances in the field.

"A List of Dag Dispersions for Industry." Acheson Colloids Co., division of Acheson Industries, Inc., Port Huron, Mich. 4 pages. Physical data and applications of 42 of the company's colloidal and semi-colloidal dispersions for the rubber, plastics, glass, and ceramics industries are reported in this publication.

Publications of Pan American Chemicals Corp., New York, N. Y.:

"Panarez Resins." 4 pages. Properties and applications of the firm's Panarez resins, synthesized, thermoplastic hydrocarbon resins similar in function to the coumarone-indene resins of equivalent softening point, for use in rubber compounding, are contained in these data sheets.

"Panarez Resins in GR-S Electrical Wire Covering Compounds." 9 pages. Some GR-S electrical wire insulation recipes using Panarez resins as plasticizers appear in this publication, together with comparative physical properties of the resulting compounds.

Publications of General Electric Co., plastics department, Pittsfield, Mass.:

"Fabricated Silicone Rubber Parts." CDP-672. 4 pages. A description of the four types of silicone rubber compounds—general-purpose, low compression set, very low temperature, and super tough—are given in this illustrated folder, together with a listing of the company's fabricating services.

"The Plastics Story." CDP-673. 8 pages. Included here is a comparative chart of the various plastics available from GE for molding purposes, their characteristics, applications, and specifications. Given also is a similar comparison of the silicone rubber grades available for molding.

Publications of Harwick Standard Chemical Co., Akron, O.:

"Thixon Primer P-2." Bulletin #03-56-6-12-55. 2 pages. Properties and applications of this universal rubber-to-metal bonding primer are contained in this data sheet.

"Thixon F-6 Primer." Bulletin #03-3-3-12-55. 2 pages. Properties and uses of this rubber-to-metal bonding primer to be used in conjunction with suggested secondary cements are included in this data sheet.

"Thixon NB." Bulletin #03-9-3-12-55. 2 pages. Described in this data sheet are the properties and application of this adhesive for the vulcanization bonding of neoprene to brass plate or primed metals.

"Thixon NM." Bulletin #03-121-3-12-55. 2 pages. This data sheet covers the properties and application of this adhesive for the vulcanization bonding of neoprene to steel and other metals.

Publications of National Aniline Division, Allied Chemical & Dye Corp., New York, N. Y.:

"Nacconates." Bulletin I-17. 24 pages. The physical and chemical properties and suggested uses of the company's diisocyanates are shown here.

"Nacconate 80" (tolylene diisocyanate isomeric mixture). Bulletin I-17A. **"Nacconate 65"** (tolylene diisocyanate isomeric mixture). Bulletin I-17B. **"Nacconate 100"** (2,4-tolylene diisocyanate). Bulletin I-17C. **"Nacconate 200"** (3,3'-bitolylene 4,4'-diisocyanate). Bulletin I-17D. **"Nacconate 300"** (diphenylmethane 4,4'-diisocyanate). Bulletin I-17E. The chemical and physiological properties and applications of these Nacconates are dealt with in these four page publications.

Publications of The B. F. Goodrich Chemical Co., Cleveland, O.:

"Properties of Hycar Latices." 2 pages. This chart includes properties and applications of Hycar high acrylonitrile, medium acrylonitrile, high styrene, and polyacrylic latices.

"Hycar Latex Newsletter." Issue No. 9. 4 pages. This issue discusses the heat sealing of Hycar 1577 to vinyl film and the curing of Hycar carboxylic latices with sodium aluminate, and includes accompanying data tables.

"Hycar Latices in Textiles." Service Bulletin H-20 (replacing H-16). 16 pages. The performance of most of the common textile materials after treatment with a variety of Hycar latices is the subject of this booklet.

"Kel-F Fluorocarbon Oils, Waxes, and Greases." M. W. Kellogg Co., Jersey City, N. J. 16 pages. The chemical and physical properties and applications of the company's series of lubricants based on polychlorotrifluoroethylene are discussed in this booklet. The lubricants are said to be highly resistant to chemical attack, temperature extremes, and emulsion and physical breakdown.

THE INDUSTRY STANDARD

B. F. GOODRICH-

FLEXOMETER

The most modern machine for HYSTERESIS TESTS on rubber and rubber-fabric combinations. It may be used to study the effects on heat generation of the time of cure, the magnitude of the applied load, changes in pigmentation, and variations caused by anisotropy in rubber compounds. Structural changes such as softening or stiffening may be followed during the period of flexure.

Send for literature and prices.

Exclusive Manufacturers

FERRY MACHINE CO., KENT, OHIO

Export Sales Through Binney & Smith, International

VINYL TIRE PARTS TUBES

SYNTHETIC RUBBER

UNCURED FRICTION

Woloch for RUBBER

SCRAP · CRUDE
ALLIED MATERIALS

FOAM RUBBER

COMPOUNDS

george Woloch CO., INC.

601 West 26th Street, New York 1, N. Y.
Phone: ORegon 5-2350
CABLE
GEOWOLOCH—New York

CRUDE RUBBER

CAMEL BACK ENDS

OFFICES AND WAREHOUSES

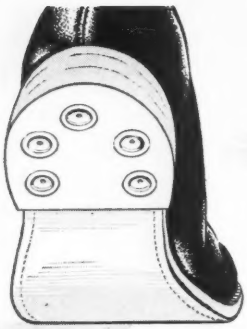
CUYAHOGA FALLS, OHIO
1587 Water St.
Phone: SWandale 4-5237

JERSEY CITY, N. J.
432 First St.
Phone: OLdfield 6-6513

LONDON, ENGLAND
Curtis Waloch Co. Ltd.
58 Bow Road, London E. 3
Phone: ADvane 5411

NEW YORK, N. Y.
601 West 26th St.
Phone: ORegon 5-2350

TIRES POLYETHYLENE BUFFINGS



non-marking abrasion resistance with...

POLYPOL S-70

When abrasion-resistant, non-marking properties are incorporated into rubber products such as heels and soles and caster wheels, which would otherwise tend to mark light-colored flooring, distinct competitive advantages are obtained.

POLYPOL S-70, a coprecipitate of lignin and a butadiene-styrene copolymer, builds excellent ABRASION RESISTANCE into NON-MARKING RUBBER compounds.

Other advantages of POLYPOL S-70 include high tear resistance and good tensile strength, plus good color properties when used with light-colored pigments.

Write for working samples and technical bulletins of the 200 series.

Polychemicals DIVISION

West Virginia Pulp and Paper Company

CHARLESTON A, SOUTH CAROLINA

COMCO

MACHINERY & EQUIPMENT
for
THE PLASTICS INDUSTRY

EXTRUDERS—*For all purposes*
INJECTION MOLDING MACHINES—*All capacities*
COMPRESSION MOLDING MACHINES—*All sizes*
VINYL CASTING MACHINES—*Fully automatic*
VACUUM & SHEET FORMING PRESSES
COATING & LAMINATING EQUIPMENT
VINYL PRINTING & EMBOSSING SYSTEMS
BANDKNIFE FOAM SPLITTING MACHINES
WIRE INSULATING ASSEMBLIES
COATING AND FUSING TRAINS

Write, telephone, or wire inquiries.

CONTINENTAL MACHINERY CO., INC.
261 Broadway, New York 7, N. Y.
Telephone: Worth 2-1650 • Cable: CONTIMAC

Publications of Ansul Chemical Co., Marinette, Wis.:

"Ansul Ethers E-121, E-141, E-161, E-181." 24 pages. The chemical and physical properties, specifications, and applications of the firm's dimethyl ethers of ethylene glycol, diethylene glycol, triethylene glycol, and tetraethylene glycol, all commercial solvents and reaction media, are described in this bulletin.

"H.A. (para Methoxy Phenol); D.M.B. (para Dimethoxy Benzene)." 16 pages. Included here are the physical and chemical properties, specifications, test methods for specifications, and applications of these products. The first is a non-discoloring antioxidant and stabilizer for plastics and rubber; and the second, a sun screening agent.

"The Magic Wand Neutralizer." Technical Bulletin 126. Herman H. Sticht Co., Inc., New York, N. Y. 8 pages. Industrial static electricity neutralizers in general and the firm's induction neutralizer in particular are discussed in this illustrated booklet.

"Linde Silicone Compounds." Linde Air Products Co., silicones department, New York, N. Y. 8 pages. The company's new organo-silicone polymers X-520, X-525, X-521, X-526, X-522, and X-527, said to have unusual lubricating and solubility properties, are discussed in this publication, and chemical and physical data for them reported.

"Your Company—Why an Accredited Medical Program?" Occupational Health Institute, New York, N. Y. 6 pages. This pamphlet is a guide to management in planning or expanding employe health programs.

"Wheelabrator Plain Tables." Bulletin No. 100D. Wheelabrator Corp., Mishawaka, Ind. 4 pages. Specifications and photographs of the firm's rubber-covered table-type airless blast cleaning machine, in four sizes, are included in this bulletin.

"15 Gallon Pilot Plant." The Patterson-Kelley Co., Inc., East Stroudsburg, Pa. 2 pages. Photographs, specifications, and a schematic drawing of the firm's 15-gallon reaction-distillation pilot plant for general experimentation in resin manufacturing and similar processes are included in ths data sheet.

"The 'D' Series: A Complete Range of Calibrated Color Pastes for Vinyl Compounding." Technical Bulletin #175. Claremont Pigment Dispersion Corp., New York, N. Y. 7 pages. Complete chemical and physical data on the firm's vinyl colors are reported in this publication.

"Venting Fundamentals with Protectoseal Equipment." Protectoseal Co., Chicago, Ill. 12-pages. The principles of the company's equipment for venting flammable liquid storage and process tanks for effective operation, fire protection, and low-cost maintenance are described. Photographs of units also are included.

"Natural Rubber." Natural Rubber Bureau, Washington, D. C. 16 pages. Free up to 25 copies; $6 per hundred thereafter. This booklet, profusely illustrated with photographs and drawings, describes for the lay reader the history, properties, and production of natural rubber.

"Molybdenum Catalysts for Industrial Processes." Climax Molybdenum Co., New York, N. Y. 24 pages. The commercial and experimental uses of molybdenum catalysts in such chemical reactions as oxidation, hydrogenation, dehydrogenation, isomerization, cyclization, chlorination, polymerization, and condensation are discussed in this booklet.

"Packaged Pilot Plants for Resin Experimentation." Instrumentation Data Sheet No. 2.10-3. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. 2 pages. Description and specifications of Patterson-Kelley distillation pilot plants with Brown instruments for development tests on plastics, resins, synthetic coatings, and other materials are given on this data sheet.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

"Safe Processing, Water-Resistant Neoprene Compounds with Exceptional Storage Life." Report BL-302. R. M. Murray and M. A. Schoenbeck. 4 pages. The advantages of the W types of neoprene, a typical recipe for Neoprene Type WRT compounds and accompanying test data, and proof of the necessity of avoiding channel blacks in these compounds are included in this publication.

"Low Modulus Neoprene Compounds." Report BL-303. D. R. Kuespert. 3 pages. The use of the company's RR-10 (mixed di-xylyl disulfides) instead of process oil in compounding neoprene stocks is discussed, together with test data after curing of stocks in which varying amounts of the RR-10 and the process oil were used. Too much oil is said to impair the physical properties of the stock.

"Low-Cost General-Purpose Hose Tube Compounds." Report BL-304. M. A. Schoenbeck and R. M. Turner. 4 pages. The properties of hose tube compounds made of Neoprene Type WHV and oil-extended GR-S type rubber are dealt with. These compounds are said to be very practical and low-cost, although not so high-quality as all-neoprene stocks.

"Chlorination of Elastomeric Products." BL-305. R. A. Stengard. 2 pages. A method of reducing surface tack of many vulcanized products through chlorination is reported in this bulletin.

"Hot Materials Belts Made with 'Hypalon' 20." Report BL-306. By B. W. Fuller. Procedures for making "Hypalon" belts for carrying hot materials are included in this publication.

"Neoprene Notebook." No. 67. Among the subjects considered in this issue are a comparison of the resistance to ozone and corona of natural rubber and neoprene, neoprene ball bearings in sanders, and neoprene-cushioned steel skiing cables.

"Facts about 'Hypalon.'" No. 3. 2 pages. A discussion of the exceptional ozone-resistance qualities of "Hypalon" is contained in this issue.

"Chlorinated Polyphenyls." Technical Bulletin No. 0-111. Monsanto Chemical Co., St. Louis, Mo. 4 pages. Properties and specifications of the firm's Aroclor 1221, 1232, and 1242, chlorinated polyphenyls especially suited for the plasticizing of polyvinyl acetate emulsion adhesives, are contained in this folder.

"Picco Solvents and Solvent Oils." Pennsylvania Industrial Chemical Corp., Clairton, Pa. 6 pages. Typical analyses of the firm's aromatic petroleum naphthas, coal-tar aromatic solvents, and solvent oils are reported in this folder.

"Organic Chlorine Compounds." F-4769. Carbide & Carbon Chemicals Co., New York, N. Y. 48 pages. Contained in this illustrated booklet are the physical properties, solvent properties, specifications, applications, and test methods of 18 of the firm's organic chlorine compounds, used in the synthetic rubber and plastics industries, among others.

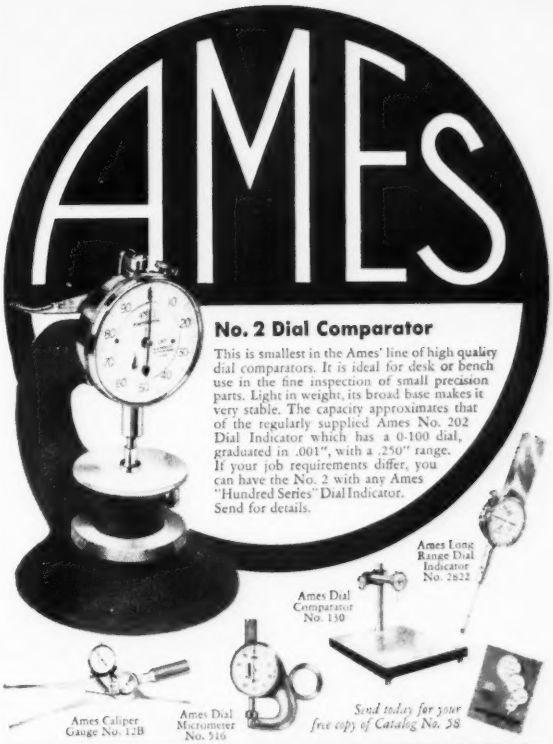
"Polypol S-70 Curing Systems." Technical Bulletin No. 204. West Virginia Pulp & Paper Co., polychemicals division, Charleston A, S. C. 4 pages. Typical recipes employing Polypol S-70, a coprecipitate of lignin and a butadiene-styrene copolymer, appear in this publication, together with physical test data for different curing systems after various curing times.

"A Guide for Selecting an Engineering Firm." Teller Co., Butler, Pa. 16 pages. The functions and services of engineering firms in general and Teller Co. in particular are described in this booklet.

Publications of Tumb-L-Matic, Inc., New York, N. Y.:

"Low-Temperature Insulated Tumbling Barrel." Bulletin LT-55. 2 pages. The firm's tumbling barrel for deflashing parts molded of soft rubber through the use of liquid CO_2 is described and illustrated.

"Wet Process Tumbling Barrels—Type XL." Bulletin No. XL-55. 2 pages. Described and pictured here is the Tumb-L-Matic tumbling barrel for deburring forgings, stampings, castings, and other metal parts.


AMES
No. 2 Dial Comparator
This is smallest in the Ames' line of high quality dial comparators. It is ideal for desk or bench use in the fine inspection of small precision parts. Light in weight, its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a 0-100 dial, graduated in .001", with a .250" range. If your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for details.
Ames Long Range Dial Indicator No. 2822
Ames Dial Comparator No. 130
Ames Caliper Gauge No. 12B
Ames Dial Micrometer No. 516
Send today for your free copy of Catalog No. 58
Representatives in principal cities.
B. C. AMES CO.
59 Ames Street
Waltham 54, Mass.
Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

The term

"COTTON FLOCKS"

does not mean cotton fiber alone

EXPERIENCE
over twenty years catering to rubber manufacturers

CAPACITY
for large production and quick delivery

CONFIDENCE
of the entire rubber industry

KNOWLEDGE
of the industry's needs

QUALITY
acknowledged superior by all users are important and valuable considerations to the consumer.

Write to the country's leading makers for samples and prices.

CLAREMONT WASTE MFG. CO.

CLAREMONT **N. H.**

The Country's Leading Makers

CONSULTANTS & ENGINEERS

GIDLEY LABORATORIES, INC.
PHILIP TUCKER GIDLEY — "RESEARCH IN RUBBER"
Consulting engineering, formulas, product development, chemical and physical tests and factory surveys.
Fairhaven **Massachusetts**

HALE & KULLGREN, INC.
Specialists in Processes and Plants for Rubber and Plastics.
A Complete Engineering Service
including: Economic Surveys; Process Design; Installation; Contracting and Operation.
613 E. Tallmadge Ave., Akron 10, Ohio

H. A. SCHLOSSER & CO.
Consultation and Technical Service
Paper, Textile and Wringer Rolls—Mechanicals
Molded Specialties—Cut Rubber Thread
401 INDUSTRIAL BANK BUILDING
PROVIDENCE 1, R. I.

FOSTER D. SNELL, INC.
Natural & Synthetic Rubber Technology
Compounding—Trouble Shooting—Testing
A personal discussion of your problems is suggested.
29 W. 15th St., New York 11, N. Y. **WA 4-8800**

Where the Compounding and Engineering problems of the Manufacturers may be solved.

TO HAVE *YOUR* COPY OF
RUBBER WORLD
ON YOUR DESK WHEN NEEDED

Subscription Postpaid

United States	$5.00
Canada	6.00
All Other Countries	7.00

Single Copy, 50 Cents in U. S.
60 Cents Elsewhere

The World's Rubber Progress Every Month

RUBBER WORLD

FOUNDED 1889

386 FOURTH AVENUE, NEW YORK 16, N. Y.

FILL IN AND MAIL WITH YOUR REMITTANCE

.....1956

Enclosed find $..... for which enter subscription to RUBBER WORLD, beginning with the ..... number.

Name .....

Firm .....

Street .....

City .....

Publications of The British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

No. 213. **"Combination of Rubber and Carbon Black on Cold Milling."** W. F. Watson. 6 pages. Results of research demonstrating the chemical association of rubber and carbon black during milling are reported in this article.

No. 214. **"Some General Results in the Theory of Large Elastic Deformations."** J. E. Adkins. 16 pages. Mathematical results valid for a wide range of both compressible and incompressible materials were obtained by the author by regarding the strain-energy function as a function of the parameters defining large elastic deformations.

"Lavelle Design Hand-Book." No. MT-56. Lavelle Rubber Co., Chicago, Ill. 76 pages. This handbook on small mechanical rubber goods is unusual in its intensive coverage of the field. Included are data on the characteristics and uses of various types of base polymers and their relative resistance to specific chemicals; and suggestions pertaining to the mechanical design of molded and extruded rubber articles, along with details on mold design and manufacturing processes common to the industry. There are also actual rubber samples representing degrees of hardness. Finally, the hand-book has an illustrated catalog section giving the specifications of a wide range of the company's stock and specialty items.

"The Nonionic Octylphenoxyethanol (OPE) Series." Rohm & Haas Co., Philadelphia, Pa. 19 pages. Physical data on the complete series of the company's Triton nonionic surface-active agents, together with suggested applications, are included in this booklet.

"Keystone Insulated Cables." Bulletin H-463. The Okonite Co., Hazard Division, Passaic, N. J. 48 pages. Physical description, electrical specifications, and test data of the company's butyl-rubber insulated heat-resistant cables are presented in this illustrated booklet.

"Isopropyl Ether." Technical Bulletin F-40003. Carbide & Carbon Chemicals Co., New York, N. Y. 8 pages. The physical and physiological properties, uses, specifications, and solubility of the company's isopropyl ether, a widely used industrial solvent, are contained in this publication.

"Barrett Standard Industrial Chemicals." Barrett Division, Allied Chemical & Dye Corp., New York, N. Y. 16 pages. The description and applications of the company's industrial chemicals, many of which are employed in rubber compounding, are reported in this 1956 catalog.

"Thixon IB-2 Rubber-to-Metal Bonding Adhesive." Bulletin No. 03-8-2-11-55. Harwick Standard Chemical Co., Akron, O. 2 pages. This data sheet reports the properties, uses, and applications of Thixon IB-2 (formerly D-314 Cement) for the vulcanization bonding of butyl compounds to primed metals or other butyls.

Publications of The B. F. Goodrich Co. Industrial Products Division, Akron, O.:

"B. F. Goodrich Multi-V-Belts," Bulletin 1700. 4 pages. Specifications and photographs of the company's grommet V-belts, high-capacity grommet V-belts, high-capacity static conducting belts, oil-resisting V-belts, and Double-V-belts are included in this publication.

"Care and Maintenance of Industrial V-Belts." 14 pages. This illustrated manual on V-belt care includes such topics as designing a new drive, double matching, installation, importance of tension, drive alignment, cleaning, and storage.

"Koroseal Industrial Clothing." Bulletin 12000. 12 pages. This is a catalog of the company's Koroseal, natural rubber, and neoprene industrial gloves, raincoats, work clothing, and aprons.

"Rubber Bands and Stationers' Items." 12 pages. This is an illustrated catalog of the company's rubber bands. Such rubber sundries as aprons, gloves, and mats are also described.

Now save more than ever before with DOW CORNING SILICONE MOLD LUBRICANTS

MIDLAND, MICHIGAN, JAN. 1956—Price reductions averaging 7½% were made effective January 1 on all Dow Corning silicone mold lubricants. This latest reduction, the eleventh in 10 years, gives you all of the added advantages of Dow Corning release agents at half their 1946 cost! During that same period, the general business price index has *increased* more than 50%.

This latest price reduction was made possible by the steadily increasing preference of leading rubber companies for Dow Corning mold lubricants and by the recent completion of a 16 million dollar expansion program that has more than doubled our productive capacity for silicone mold release agents.

That's a result of ten years' experience in the press rooms of the world's greatest rubber plants where it has been proved time and time again that Dow Corning silicone mold lubricants cut mold maintenance costs as much as 80%; reduce rejects to the vanishing point; improve sales appeal by producing finished parts with sharp detail and superior surface finish.

From every standpoint—including lower original cost, the major production economies and the improved quality of finished products—Dow Corning silicone mold lubricants are now more than ever before your best buy!

NEW BOOKLET

describes how to use silicone mold lubricants . . . more effectively . . . more economically.

PRICES REDUCED 7½% ON DOW CORNING RELEASE AGENTS

SEND COUPON
FOR YOUR PERSONAL COPY NOW

Dow Corning Corporation, Dept. 9402B, Midland, Michigan
Please send me booklet "Dow Corning Silicone Mold Lubricants"

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D.C.
CANADA: DOW CORNING SILICONES LTD., TORONTO GREAT BRITAIN: MIDLAND SILICONES LTD., LONDON FRANCE: ST. GOBAIN, PARIS

MARKET REVIEWS

Natural Rubber

Natural rubber, after a month of price stability, nosedived on both the spot and the future markets during the period from December 16 to January 15, with all signs pointing to a continuing drop for the next few weeks. From a December 5 high of 49.75¢ for R.S.S. #1 on the New York spot market, the price plummeted to 42.75¢ by January 13 and to 42.00¢ by January 17, the date of this writing.

During the December 16-January 15 period itself, the #1 grade remained on a steady keel at 48.38¢ for seven consecutive trading days beginning with December 19, an evenness typical of the Christmas season. Subsequently the price fell away with remarkable singleness of purpose, creating a high-low differential for the period of 5.63¢ on the spot market. Futures, of course, slid as well, and trading on the New York Commodity Exchange was off last period's levels.

Observers attributed the decline to the elimination of all other factors except supply and demand. More rubber was available than buyers. Russian purchases had ceased. American consumers were waiting for indications of the expected automotive production in 1956. London and Singapore commission houses went on a simultaneous selling spree. And the holiday season cut buying activity around the world. So natural rubber pushed down a long ski-slope, the bottom of which is still obscured.

Statistically, on the New York Commodity Exchange, sales for the second half of December were 27,940 tons, bringing the monthly total to 58,080 tons. Sales during the first half of January were 24,170 tons, or 52,110 tons for the December 16-January 15 period.

Near-March stocks began the period at 43.75¢ for the #1 grade and were at 41.35¢ on January 13. Far-December stocks began at 35.70¢ and concluded the period at 35.20¢, a poor indication, however, of the collapsed price structure.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures 1956	Dec. 16	Dec. 23	Dec. 30	Jan. 6	Jan. 13
Mar.	43.75	46.05	45.30	43.75	41.35
May	40.40	42.30	41.65	40.70	38.55
July	38.70	40.40	39.50	39.15	37.35
Sept.	37.15	38.65	38.00	37.70	36.35
Dec.	35.70	36.80	36.10	36.25	35.20
Total weekly sales, tons.	10,000	12,570	14,340	9,310	14,860

On the physical market, December monthly spot prices for representative grades were as follows: R.S.S. #1, 48.59¢; R.S.S #3, 47.36¢; #3 Amber Blankets, 35.17¢; and Flat Bark, 28.74¢. For the first half of January, R.S.S. #1 averaged 44.58¢.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Dec. 16	Dec. 23	Dec. 30	Jan. 6	Jan. 13
R.S.S.: #1	47.88	48.38	47.88	45.50	42.75
2	46.88	47.38	46.38	45.25	42.50
3	46.50	47.00	46.50	45.00	42.25
Latex Crepe #1 Thick	48.75	49.25	49.50	46.88	45.50
Thin	48.75	49.25	49.50	46.88	45.50
#3 Amber Blankets	35.00	36.50	36.75	36.25	35.25
Thin Brown Crepe	34.50	36.00	36.25	35.75	34.75
Flat Bark	28.38	29.13	29.25	28.50	28.00

Synthetic Rubber

It has been generally believed that production of original-equipment tires during December and January would drop somewhat in accordance with the cutback in automotive output widely anticipated. A lower level of tire production would mean less demand for GR-S type rubbers, which would allow the filling of some of the huge backlog of orders for other industrial needs. No such drop in tire production has occurred, according to observers, and the shortage of GR-S is still severe. An easing of this situation is expected during February and March.

Added pressure on American synthetic producers to shunt a greater percentage of their output into the slightly more profitable export trade has come in the form of the United Kingdom's announcement that it would seek greater imports of synthetic rubber during 1956. The din raised by this revelation was not expected to dissuade the U.K. from its decision. U.K. economic leaders seem determined to alter the natural-synthetic ratio in favor of synthetic, a commendably realistic approach to long-range economic strategy. Such imports can only come from the United States, for the most part. This demand will add to the domestic shortage of GR-S type rubbers and provide another fillip to the upgrading of price schedules.

The Goodrich-Gulf acquisition of the Institute plant cleared another hurdle when Attorney General Brownell transmitted his vigorous approval of the deal to Congress on January 12, while denying that Goodrich-Gulf would have anything like a controlling interest in the American synthetic rubber industry. Some Congressional voices are expected to be raised against the sale, but there was little doubt that Congress would eventually go along with Mr. Brownell.

No price or grade changes occurred in synthetic rubber during the December 16-January 15 period.

Latex

Activity in *Hevea* and synthetic latices during the period from December 16 to January 15 was generally quiet, a situation characteristic of the Christmas and New Year holiday period. Business in *Hevea* latex did not improve despite the lower price of the material, and the market was seen to be glutted with unusually heavy supplies coming off Far Eastern plantations. American consumers seemed reluctant to strengthen their stocks at this time, hoping, perhaps, for a continued fall in price. One British observer commented that only lower prices could prompt the absorption of these heavy available supplies into consumers' stocks. Synthetic latices were still too highly competitive.

One estimate of American natural latex consumption during 1955 was 84,000 tons, dry weight, a 13% increase over the previous year's figure. The same source estimated 1955's GR-S type latex consumption to have been 61,000 tons, dry weight, an increase of 38% over 1954 consumption. It was said that a greater ratio of the synthetic had been used because of its lower price, higher production, and improved quality.

Prices for ASTM centrifuged concentrated latex, in tank-car quantities, f.o.b. rail tank cars, ranged during the period from 50 to 54¢ per pound solids. Prices of synthetic latices remained stable, being quoted as GR-S type, 26-32.3¢; neoprene, 37-47¢; and N-type, 46-54¢.

Final October and preliminary November domestic statistics for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Oct.	0	6,900	7,209	12,156
Nov.	0		6,593	12,493
GR-S				
Oct.	6,213	18	5,704	5,798
Nov.	6,873	60	6,051	6,190
Neoprene				
Oct.	922	0	739	1,075
Nov.	1,044	0	867	1,016
Nitrile				
Oct.	883	0	611	1,196
Nov.	781	0	591	1,157

Reclaimed Rubber

The reclaimed rubber market was down somewhat in business activity during the period from December 16 to January 15, compared to the previous period's high levels. Year-end inventories among many consumers were cited as one of the causes of the decline. An optimistic outlook, however, prevails for the months ahead. It is said that although some cutbacks have been announced for the automotive industry, the

are TACKY compounds

costing YOU TIME and MONEY?

Here's how you can eliminate tack and get added benefits as well.

Use Polymel DX as a plasticizer in proportions ranging from 5 to 35 parts on the rubber and processing problems resulting from tackiness will usually disappear.

In addition, POLYMEL DX gives . . .

- **Good Mold Flow**
- **Reduced Shrinkage**
- **Fine Surface Finish**
- **Good Retention of Outline**
- **Excellent Dispersion of Pigment in Highly Loaded Stocks**

POLYMEL DX is a low-cost styrene copolymer resin available in either powder or 2" lump form. If you have not yet investigated this unusual material, write today for a generous sample.

Prices fob Baltimore		
	1 drum to 4900 lbs.	—.1475¢ lb.
	5000 lbs. to truckloads	—.1425¢ lb.
	Truckloads	—.1375¢ lb.

THE POLYMEL CORPORATION

MANUFACTURERS OF
compounding ingredients for reinforcing, plasticizing, extending and processing natural and synthetic elastomers.

Plaza 2-1240 — 1800 BAYARD ST., BALTIMORE 30, MD.

continuing shortage of GR-S type rubber will help bolster the market.

Reclaimed rubber prices, according to reports, remained the same as last month's.

RECLAIMED RUBBER PRICES

	Lb.
Whole tire: first line	$0.105
Fourth line	.0925
Inner tube: black	.15
Red	.21
Butyl	.16
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Scrap Rubber

Fair business characterized the scrap rubber market during the period from December 16 to January 15, representing a small improvement over last month's conditions. Suppliers were filling mixed auto-tire orders to Naugatuck, among others, despite the slowing effect the cold weather was having on scrap collections. Most reclaimers were said to be passing up their frozen outdoor storage piles in favor of new supplies.

Period-end prices were unchanged, except for fractional increases at eastern points of black and red auto tubes. Butyl tubes fell fractionally, again at eastern points.

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.00/16.00	$16.00
S. A. G. auto tires	Nom.	13.00
Truck tires	Nom.	14.00
Peelings, No. 1	41.00/42.00	41.00/42.00
2	23.00	24.00
3	15.50	Nom.
Tire buffing	17.00	14.00/15.00
	(¢ per Lb.)	
Auto tubes, mixed	4.50	4.50
Black	5.75	5.50
Red	6.75	6.50
Butyl	5.75	6.00

Cotton Fabrics

Trading continued active on the industrial fabrics market during the period from December 16 to January 15, with demand particularly heavy for wide sateens, enameling ducks, wide sheetings, and a number of specialty ducks. Relatively little buying, however, was done for second quarter delivery as consumers sought for indications of the extent of automotive production during 1956. Tight supplies characterized the market, except for wide drills, in which trading was relatively moderate. The price tone throughout the period remained firm.

Although some year-end inventory liquidations have shown up on the market in second hands, most of this material has been in the form of odd lots of special or off-beat constructions.

Observers look forward to the new year with optimism, expecting it to be second only to 1955 in volume of business and good income. Since the better part of this business takes place in automotive production, the statements by Secretary of Commerce Sinclair Weeks and General Motors' head, Harlow H. Curtice, that auto output would be high, though behind 1955's production, were particularly encouraging. Excellent prospects were also seen for mechanical rubber goods, such as conveyor belts and hose.

Prices remained steady over the period, except for fractional increases in some ducks. Period-end prices follow:

COTTON FABRICS

Drills	
59-inch 1.85 yd. ..... *yd.*	$0.40
2.25-yd.	.345
Ducks	
38-inch 1.78-yd. S.F. .. *yd.*	nom.
2.00-yd. D.F.	.325/.33
51.5-inch, 1.35-yd. S.F. ..	.4738
Hose and belting	.67
Raincoat Fabrics	
Printcloth, 38½-inch, 64x60, 5.35-yd. .. *yd.*	.1425
6.25 yd.	.12
Sheeting, 48-inch, 4.17-yd.	.20
52-inch, 3.85-yd.	.24
Osnaburgs	
40-inch 2.11-yd. ..... *yd.*	.265
3.65-yd.	.1675
Chafer Fabrics	
14.40-oz./sq. yd. Pl. ... *yd.*	.70
11.65-oz./sq. yd. S.	.61
10.80-oz./sq. yd. S.	.6575
8.9-oz./sq. yd. S.	.67
Other Fabrics	
Headlining, 59-inch, 1.65-yd., 2-ply .... *yd.*	.47
64-inch, 1.25-yd., 2-ply	.595
Sateens, 53-inch, 1.32-yd. ..	.5675
58-inch, 1.21-yd.	.62

Rayon

Observers reviewing the position of the rayon and acetate industry during 1955 describe it as the best year since the peak year of 1950. During the first 11 months of 1955, a total of 1,156,900,000 pounds of rayon and acetate yarn, staple, and tow was shipped by producers to domestic and foreign markets, representing a gain of 16% above the total shipped during the same period of 1954. A 1955 yearly total of 1,260,000,000 pounds is expected. The 1950 total was 1,268,500,000 pounds.

Rayon high-tenacity yarns made the best showing, rising 28% above the previous year's period to 397,000,000 pounds for the first 11 months. The tire industry and related users were shipped 311,100,000 pounds of rayon and acetate yarn, 29% above last year's figure during the period. During the first nine months of 1955, about 204,000,000 pounds of rayon tire fabric and cord were produced in the United States.

Complete figures and breakdowns will be made available for the March market report.

American Enka Corp. and American Viscose Corp. have boosted the price of their 1100, 1150, 1650, and 2200 denier tire yarns by 3-5¢ a pound. Since other tire yarn producers, including E. I. du Pont de Nemours & Co., Inc., Industrial Rayon Corp., and North American Rayon Corp., are virtually certain to follow suit, the new prices published below should be considered tentative.

RAYON PRICES

Tire Yarns		
High-Tenacity		
1100/ 480	$0.62/	$0.67
1100/ 490	.62/	.67
1150/ 490	.62/	.67
1165/ 480	.63	
1230/ 490	.62	
1650/ 720	.61/	.66
1650/ 980	.61/	.66
1875/ 980	.61	
2200/ 960	.60/	.65
2200/ 980	.60/	.65
2200/1466	.67	
4400/2934	.63	
Super-High-Tenacity		
1650/ 720	.64/	.69
1900/ 720	.64	
Tire Fabrics		
1100/490/2	.72	
1650/980/2	.695/	.73
2200/980/2	.685	

Financial

(*Continued from page 702*)

Shell Oil Co., New York, N. Y., and subsidiaries. First nine months, 1955: net earnings, $85,646,413, equal to $3.11 a capital share, compared with 89,544,914, or $3.26 a share, in the like period of 1954; sales and other revenues, $1,087,262,388, against $975,710,779.

Sheller Mfg. Corp., Portland, Ind. January 1-September 30, 1955: net profit, $2,679,546, equal to $2.81 a share, against $2,058,630, or $2.16 a share, in the same months of 1954.

Skelly Oil Co., Kansas City, Mo. Nine months ended September 30, 1955: net profit, $22,814,984, equal to $3.97 a share, against $20,933,101, or $3.64 a share, in the 1954 period; sales, $167,353,041, against $156,312,427.

Union Asbestos & Rubber Co., Chicago, Ill. First nine months, 1955: net loss, $93,252, contrasted with net profit of $228,015 in the 1954 period; net sales, $10,184,012, against $10,897,670.

United Carbon Co., Charleston, W. Va., and subsidiaries. Nine months to September 30, 1955: net profit, $4,014,722, equal to $3.36 a capital share, compared with $2,960,779, or $2.48 a share, a year earlier; net sales, $33,266,317, against $25,181,765.

S. S. White Dental Mfg. Co., Philadelphia, Pa. Nine months ended September 30, 1955: net earnings, $631,534, equal to $1.72 a share, against $458,650, or $1.25 a share, a year earlier.

enter the fabulous NEW

Look for this man!
...your Velsicol Representative a qualified chemist who can show you how to make rubber products at lower cost with Velsicol Hydrocarbon Resins.

VELSICOL $1,000,000 Recipe Contest

Here's all you have to do!

- Fill out the coupon below for a free sample of Velsicol Hydrocarbon Resins
- Test Velsicol Hydrocarbon Resins in your rubber compounds
- Compare the results with your present recipes

THREE BIG FIRST PRIZES!

1. BETTER PRODUCTS
Velsicol Resins will make your products perform better in use, and do better in the market place. This prize is worth at least a million to your pride, prestige, and **company profits.**

2. LOWER PRODUCTION COSTS
You have your choice of taking this prize in the form of greater profits or, if you're far sighted, in lower prices that will win customers and murder competition.

3. INCREASED SALES
This prize will get you your company's "Genius Cum Laude Award", not to mention the mundane delights of financial gain.

VELSICOL
CHEMICAL CORPORATION

VELSICOL

VELSICOL CHEMICAL CORPORATION
Dept. 90, 330 East Grand Ave., Chicago 11, Illinois
Gentlemen:
☐ Please send me your technical bulletin No. 218.
☐ Please send me samples of Velsicol Resins.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

Mail the coupon now for **FREE** *samples and technical literature!*

STATISTICS of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	GR-S	S-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1949	660,792	288,882	21,717	54,046	35,215	11,072	1,071,724
1950	802,249	350,801	28,086	60,915	50,067	12,037	1,304,155
1951	733,048	694,583	9,946	76,475	58,907	15,333	1,588,292
1952	805,997	636,969	17,885	81,630	65,745	16,228	1,624,454
1953	647,615	668,386	12,342	79,801	80,495	20,198	1,508,837
1954							
Jan.	47,170	43,524	853	5,539	6,513	1,620	105,219
Feb.	42,645	40,661	1,030	4,801	6,206	1,574	96,917
Mar.	47,721	43,372	1,092	5,214	5,190	1,900	104,489
Apr.	49,855	34,384	1,167	6,004	5,601	1,645	98,656
May	55,983	35,117	1,120	4,581	4,828	1,960	103,589
June	66,698	35,829	1,263	3,182	5,101	1,696	113,769
July	40,614	35,415	1,388	4,960	4,673	1,814	88,864
Aug.	59,124	36,843	1,803	5,003	5,313	1,624	109,710
Sept.	48,618	38,937	2,183	4,675	6,036	1,718	102,167
Oct.	49,432	42,000	1,938	5,117	6,644	1,864	106,995
Nov.	45,474	41,109	2,021	5,060	6,839	1,913	102,416
Dec.	43,557	45,507	1,849	4,666	6,206	2,068	103,853
Total	596,848	472,698	17,707	58,802	69,150	21,396	1,236,601
1955							
Jan.	49,941	57,607	1,436	3,220	6,983	2,099	121,286
Feb.	50,880	55,293	1,149	3,727	6,910	1,729	119,688
Mar.	61,250	63,940	1,229	5,256	7,132	2,158	140,965
Apr.	61,113	50,745	10,081	5,148	8,359	2,534	137,980
May	61,042	3,592	63,235	5,115	7,852	3,122	143,958
June	52,762	3,739	61,658	3,872	5,919	3,850	131,800
July	43,626	1,640	64,863	5,395	6,904	3,700	126,128
Aug.	59,840	....	68,835	4,203	8,511	3,224	144,613
Sept.	50,459	....	68,157	5,097	7,677	3,142	134,622
Oct.	45,720	....	73,103	5,501	8,118	2,958	135,400
Nov.*	....	....	75,442	4,935	8,537	2,931	....

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	GR-S	S-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1949	574,522	299,420	21,717	52,664	31,753	8,827	988,903
1950	720,268	388,427	27,803	66,348	43,781	11,930	1,258,557
1951	454,015	617,200	9,244	70,500	48,887	13,066	1,212,912
1952	453,846	648,816	17,604	71,229	55,522	13,866	1,260,883
1953	553,473	611,748	12,433	77,826	65,900	16,929	1,338,309
1954							
Jan.	46,960	37,707	982	5,438	4,774	1,272	97,133
Feb.	46,897	36,765	942	5,696	4,467	1,190	95,957
Mar.	53,709	42,074	1,062	6,300	5,177	1,447	109,769
Apr.	51,451	40,194	1,130	6,241	4,684	1,395	105,105
May	51,398	40,030	1,144	5,602	4,486	1,366	104,026
June	54,253	43,782	1,192	5,961	4,769	1,491	111,448
July	37,894	31,474	1,326	4,108	3,499	1,145	79,446
Aug.	38,069	30,800	1,596	3,569	4,647	1,439	80,120
Sept.	52,412	40,204	1,994	5,138	5,049	1,493	106,290
Oct.	55,970	45,002	2,061	4,711	4,931	1,604	114,279
Nov.	53,326	44,429	1,980	3,967	5,276	1,635	110,613
Dec.	55,096	50,540	1,935	4,583	5,434	1,638	119,226
Yr.-end adj.	− 1,150	....	....	+ 150	....	+ 600	....
Total	596,285	483,001	17,344	61,464	57,203	17,715	1,233,412
1955							
Jan.	56,911	54,728	1,643	4,478	5,676	1,854	125,290
Feb.	50,997	54,707	1,293	4,312	5,476	1,826	118,611
Mar.	58,472	62,548	1,189	4,839	6,423	2,119	135,590
Apr.	52,963	54,091	5,655	4,321	5,884	2,145	125,059
May	54,746	2,533	60,325	4,455	6,143	2,273	130,475
June	56,282	3,666	62,226	4,704	6,320	3,266	136,464
July	46,166	2,690	50,398	3,894	4,294	2,056	109,498
Aug.	48,359	....	59,746	4,307	6,450	2,841	121,703
Sept.	50,963	....	63,330	4,578	6,197	2,613	127,681
Oct.	54,995	....	66,744	4,739	6,626	2,268	135,372
Nov.*	52,835	....	68,326	4,418	6,928	2,262	134,769

* Preliminary.
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

EAGLE-PICHER

Lead & Zinc Compounds

meet the specific demands of the rubber industry . . .

Eagle-Picher manufactures a comprehensive line of both lead and zinc compounds for the rubber industry. Rigid product control is maintained from the ore to the finished product. More than a century of experience assures you of customer service unequalled in the field.

Zinc Oxides	Litharge
Basic White Lead Silicate	Sublimed Litharge
Basic Carbonate of White Lead	Red Lead (95% 97% 98%)
Sublimed White Lead	Sublimed Blue Lead

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY

Since 1843

General Offices: Cincinnati 1, Ohio

On the Pacific Coast: ASSOCIATED LEAD AND ZINC COMPANY
2700 16th Ave., S. W., Harbor Island, Seattle 4, Wash. • 1336 16th St., Oakland 7, Calif.
1329 Willow St., Los Angeles 13, Calif.

Thomaston TEXTILES

for the RUBBER INDUSTRY

THOMASTON Fabrics — SINCE 1900

specifically engineered to meet your needs

TIRE FABRICS • HOSE AND BELT DUCKS
CHAFERS • YARNS • THREADS • CORDAGE
SHEETINGS • COATING FABRICS
DIVERSIFIED COTTON FABRICS

Other Available Facilities:
Bleaching, Dyeing, Finishing, Sewing

Thomaston Mills

THOMASTON, GEORGIA • NEW YORK OFFICE: 40 WORTH STREET
AKRON, OHIO OFFICE: 308 AKRON SAVINGS AND LOAN BUILDING

FINELY PULVERIZED, BRILLIANT
COLORS
FOR RUBBER-VINYLS

Western Representative: FRED L. BROOKE CO.,
P. O. Box 463, Oak Park, Ill.

Ohio Representative: PALMER SUPPLIES CO.,
2281 Scranton Road, Cleveland 13
800 Broadway, Cincinnati 2

Pacific Coast: ERWIN GERHARD,
40 California St., San Francisco 11, Calif.

BROOKLYN COLOR WORKS INC.,
MORGAN & NORMAN AVES., BROOKLYN 22, N.Y.

THE ALUMINUM FLAKE COMPANY
AKRON 14, OHIO
Manufacturers of
ALUMINUM FLAKE
A COLLOIDAL HYDRATED ALUMINUM SILICATE
REINFORCING AGENT for
SYNTHETIC and NATURAL RUBBER
New England Agents — Warehouse Stocks
H. A. SCHLOSSER & CO.
401 INDUSTRIAL BANK BUILDING
PROVIDENCE 1, RHODE ISLAND

QUALITY **INTEGRITY** **SERVICE**

75 YEARS WITHOUT REORGANIZATION

BELTING
Transmission—Conveyor—Elevator

HOSE
for every purpose
Water—Fire—Air—Steam

HOME RUBBER CO. TRENTON, N.J. STEAM NEVER BURN BLOW OUT PACKING CHICAGO NEW YORK

PACKING
Sheet & Rod Packings
for every condition

Mechanical Specialties of Every Description

HOME RUBBER COMPANY
Factory & Main Office
TRENTON 5, N. J.

LONDON: 107 Clifton St., Finsbury — CHICAGO: 168 North Clinton St. — NEW YORK: 80-82 Reade St.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1943	3,638	....	....	....	....	5,638
1944	2,443	....	....	....	....	2,443
1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1954						
Jan.	12,375	5,001	1,019	703	6,723	19,098
Feb.	13,963	5,269	963	625	6,857	19,820
Mar.	11,870	5,247	975	588	6,810	18,680
Apr.	10,803	5,273	1,062	600	6,935	17,738
May	8,907	5,180	1,110	655	6,945	15,852
June	9,460	5,591	1,020	646	7,257	16,717
July	10,171	5,363	1,004	831	7,198	17,369
Aug.	12,009	4,220	1,019	993	6,232	18,241
Sept.	11,546	4,504	984	908	6,396	17,942
Oct.	10,952	4,745	1,001	950	6,696	17,648
Nov.	9,759	4,943	1,055	939	6,937	16,696
Dec.	11,133	5,134	1,087	811	7,032	18,165
1955						
Jan.	9,684	5,861	1,067	812	7,740	17,424
Feb.	8,619	5,753	879	663	7,295	15,914
Mar.	7,820	6,940	909	637	8,486	16,306
Apr.	6,790	7,098	786	823	8,707	15,377
May	8,854	7,021	767	853	8,641	17,459
June	9,788	6,645	817	1,215	8,677	18,133
July	11,934	6,950	850	1,397	9,197	20,779
Aug.	11,962	6,201	885	1,319	8,405	20,367
Sept.	12,595	6,448	975	1,527	8,950	21,545
Oct.	12,156	5,798	1,075	1,196	8,069	20,225
Nov.*	12,493	6,190	1,016	1,157	8,363	20,856

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1946	8,012	24,810	13,595	....	38,405	46,417
1947	17,675	22,474	6,089	....	28,563	46,238
1948	32,630	21,494	5,022	....	26,516	59,146
1949	29,974	21,357	3,651	....	25,008	54,982
1950	54,401	31,339	5,725	....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1954						
Jan.	5,396	4,089	592	471	5,152	10,548
Feb.	5,681	3,928	742	375	5,045	10,726
Mar.	5,682	4,142	709	483	5,334	11,016
Apr.	5,663	4,046	803	461	5,310	10,973
May	3,806	3,839	680	623	5,142	8,940
June	6,590	4,019	620	585	5,224	11,814
July	5,181	2,589	448	643	3,680	8,861
Aug.	7,571	1,995	756	682	3,433	11,004
Sept.	6,480	4,190	676	581	5,447	11,927
Oct.	7,210	5,190	742	780	6,712	13,922
Nov.	6,335	5,115	717	558	6,390	12,725
Dec.	8,888	5,238	729	624	6,591	15,479
Total	74,483	48,379	8,214	6,866	63,459	137,942
1955						
Jan.	7,853	6,199	617	624	7,440	15,293
Feb.	6,110	5,634	797	641	7,072	13,182
Mar.	7,611	7,078	854	672	8,604	16,215
Apr.	8,550	5,680	975	1,022	7,677	16,227
May	8,849	5,292	880	808	6,980	15,829
June	7,736	4,688	905	1,434	7,027	14,763
July	8,702	4,753	641	993	6,387	15,089
Aug.	8,885	4,456	881	917	6,254	15,139
Sept.	8,109	5,698	994	1,086	7,778	15,887
Oct.	6,900	6,231	922	883	8,036	14,936
Nov.*	....	6,933	1,004	781	8,718	....

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	S-Types	Butyl	Neoprene	N-Type	Total
1943	36,395	1,033	6,644	3,223	47,295
1944	122,412	9,992	12,262	5,366	150,032
1945	170,571	18,378	9,703	4,802	203,454
1946	83,090	19,478	10,470	3,755	116,793
1947	40,606	13,184	5,237	3,339	62,366
1948	96,304	10,995	5,072	2,762	115,133
1949	77,743	12,224	4,654	3,433	98,054
1950	36,942	7,243	5,733	2,840	52,758
1951	105,271	12,481	8,379	3,821	129,952
1952	83,861	22,716	8,535	3,875	118,987
1953	135,153	24,866	11,480	4,346	175,845
1954					
Jan.	138,692	24,733	13,065	4,349	180,839
Feb.	143,202	23,573	12,518	4,112	183,405
Mar.	145,178	22,329	12,575	4,202	184,284
Apr.	136,446	21,673	12,665	4,199	174,983
May	131,604	20,077	11,467	4,435	167,583
June	124,678	17,534	10,646	4,314	157,172
July	128,752	18,150	11,315	4,727	162,944
Aug.	135,164	19,672	10,710	4,613	170,159
Sept.	128,313	18,513	10,288	4,548	161,662
Oct.	127,204	18,653	11,038	4,272	161,167
Nov.	121,772	19,338	11,429	4,366	156,905
Dec.	115,499	19,267	11,349	4,280	150,395
1955					
Jan.	114,976	17,079	11,598	4,160	147,813
Feb.	111,796	15,424	10,555	3,885	141,660
Mar.	113,594	15,096	11,037	3,786	143,513
Apr.	112,156	14,813	10,863	3,706	141,538
May	†109,381	14,449	10,283	4,161	138,274
June	†103,844	13,053	9,755	4,356	131,008
July	†110,281	13,288	11,213	5,528	140,310
Aug.	†108,211	12,395	11,326	5,525	137,457
Sept.	†107,641	12,190	11,209	5,452	136,492
Oct.	105,746	12,146	11,820	5,041	134,753
Nov.*	105,011	11,564	11,294	5,008	132,877

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.
† Revised through inventory adjustment.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1946	295,612	275,410	14,461	33,666
1947	291,395	288,395	14,556	35,943
1948	266,861	261,113	11,428	32,630
1949	224,029	222,679	10,367	28,263
1950	314,008	303,733	11,740	35,708
1951	366,700	346,121	14,722	45,082
1952	274,981	280,002	11,180	30,664
1953	298,336	285,050	11,397	32,319
1954				
Jan.	20,026	19,114	912	31,865
Feb.	21,122	19,461	941	32,393
Mar.	23,383	22,882	830	32,148
Apr.	21,658	21,883	1,050	31,359
May	21,316	20,436	1,071	31,105
June	22,342	22,321	1,068	30,845
July	18,041	16,301	586	31,304
Aug.	15,519	17,660	647	27,692
Sept.	22,352	19,926	641	29,632
Oct.	23,566	22,098	808	30,395
Nov.	22,986	22,321	862	29,451
Dec.	25,790	24,546	816	30,746
Total	258,101	249,049	10,232	....
1955				
Jan.	25,336	25,322	1,041	29,656
Feb.	25,444	24,333	1,085	30,125
Mar.	29,574	28,674	1,088	30,311
Apr.	26,817	26,609	1,088	30,068
May	27,911	27,652	1,056	29,528
June	30,451	29,157	1,128	29,725
July	24,114	22,563	1,176	29,939
Aug.	25,223	25,790	1,144	27,956
Sept.	26,512	26,340	1,018	27,110
Oct.	28,038	26,597	1,381	27,565
Nov.*	29,317	27,393	1,200	28,458

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES

Light face type $1.25 per line (ten words)
Bold face type $1.60 per line (eight words)
Allow nine words for keyed address.

SITUATIONS WANTED RATES

Light face type 40c per line (ten words)
Bold face type 55c per line (eight words)

SITUATIONS OPEN RATES

Light face type $1.00 per line (ten words)
Pold face type $1.40 per line (eight words)

Letter replies forwarded without charge, but no packages or samples.

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS OPEN

RUBBER CHEMIST

Experienced in tires and mechanical goods to organize compounding studies and write technical bulletins. Location: Borger, Texas. Please submit qualifications, background and salary requirement to:

J. M. HUBER CORPORATION
100 Park Avenue, New York 17, N. Y.

WANTED

MANUFACTURER'S AGENT for line of Neoprene and Hypalon protective coatings. Eastern seaboard and midwestern states. Address Box 1861, care of RUBBER WORLD.

MAINTENANCE ENGINEER FOR PLASTIC CALENDERS, mills, Banbury. Must be experienced. Address Box No. 1862, care of RUBBER WORLD.

CHIEF LATEX CHEMIST TO DIRECT SOUTHERN MANUfacturing division of latex compounds for textile industry. Must be tops on compound experience and development. Excellent opportunity in established growing concern. State fully qualifications and requirements. Address Box No. 1863, care of RUBBER WORLD.

TECHNICAL DIRECTOR

New and modern northern Ohio precision molded plant specializing in O-Rings, Diaphragms, Seals, etc., wants experienced compounder to head up both production and research. All replies confidential. Address Box No. 1864, care of RUBBER WORLD.

CHEMICAL SUPPLIER TO RUBBER AND LATEX INDUSTRIES overseas requires technical salesman. Compounding experience necessary. Overseas traveling required periodically. Excellent future prospects for right man. Office located in New York City. Address Box No. 1865, care of RUBBER WORLD.

OPENING IN LABORATORY OF SUPPLIER OF CHEMICALS to rubber and plastics industries for man 30 or under with five years of general rubber compounding experience. Opportunity for advancement. Location: New England. Address Box No. 1868, care of RUBBER WORLD.

DISTRICT MANAGER

Long established AAA1 manufacturer of Industrial Rubber Products, Belting, Hose, and Packing requires New York District Manager. To qualify applicant must be under 46 years of age, established reputation for successful selling and be an inspirational leader of men. Knowledge Rubber Products and previous experience contacting National Accounts preferred although not a requirement for consideration. A real opportunity for a producer of sales. Salary and bonus. Submit complete résumé which will be held in strict confidence. Address Box No. 1859, c/o RUBBER WORLD.

SITUATIONS OPEN (Continued)

PROGRESSIVE COMPANY WITH WELL-EQUIPPED LABORAtory is offering opportunities to two graduate chemists or chemical engineers interested in the development of natural, synthetic, and reclaim formulations. Concern is located in the East, and is currently recognized as a leader in its field. Replies confidential—our employes are familiar with this advertisement. Please submit résumé and salary requirements with first letter. Address Box No. 1866, care of RUBBER WORLD.

ASSISTANT TO MANAGER

Small rubber plant doing molded specialties and rubber linings contemplates expansion into rubber roll work, extrusions, and some plastic items. Applicant should know compounding and formulations, know equipment needed for expansion, read blueprints, and do some estimating; some sales engineering ability and new business contacts to bring with him. An exceptional opportunity for the right person. A small progressive organization that can offer the advantages of a small cooperative group. Give complete résumé of education, past and present employment, and how soon you could start. Address Box No. 1867, care of RUBBER WORLD.

RUBBER CHEMIST OR COMPOUNDER

Preferably with Rubber Flooring and Slabsole stock experience. Knowledge of Vinyl compounding and processing would be desirable. Must be willing to relocate. Give complete biography, references, and salary requirements. Address Box No. 1869, care of RUBBER WORLD.

UNUSUAL OPPORTUNITY

WELL-ESTABLISHED EASTERN FIRM HAS OPENING FOR A CHEMIST

For development work and to assist in production.

The man we desire must be experienced in his own field.

Give complete résumé in first letter and salary expected.

All replies will be held in strict confidence.

Address Box No. 1860, c o RUBBER WORLD

PRODUCT ENGINEER FOR INDUSTRIAL RUBBER HOSE

Long-established rubber company, located in New Jersey, has position open for a qualified man experienced in hose design and specification hose, both braided and mandrel made. Give full résumé and salary requirements. Our employes have been informed of this advertisement. Address Box No. 1870, care of RUBBER WORLD.

WANTED: BY MEDIUM-SIZED PROGRESSIVE NEW ENGLAND mechanical goods manufacturer: a Rubber Technologist, with degree in Chemistry or Physics, or with practical laboratory experience. State age, background, and salary requirement. Full benefits. Address Box No. 1871, care of RUBBER WORLD.

MAINTENANCE MAN—FAMILIAR WITH RUBBER MACHINERY and with knowledge of rubber industry. Metropolitan area. State age, salary expected, experience, and other qualifications. Address Box No. 1874, care of RUBBER WORLD.

NEW IDEAS—NEW TOOLS—NEW BLOOD NEEDED BY AUTO INDUSTRY

Well-established active Detroit agency seeks to represent midwestern rubber company. Personnel includes experienced rubber engineer. Write P. O. Box 5151, Detroit 35, Mich.

SALES REPRESENTATIVE

Man 30 to 40 to travel extensively in Europe as representative of AAA-1 American company. Plastic Sales experience essential; Rubber Sales experience helpful. Furnish résumé showing experience, education, languages, salary requirements, etc. Address Box No. 1878, care of RUBBER WORLD.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	S-Types	Butyl	Neoprene	N-Type	Total
1945	76,555	980	5,837	406	83,778
1946	68,763	495	2,642	797	72,697
1947	7,951	62	2,617	755	11,385
1948	1,093	21	2,875	885	4,874
1949	1,401	178	3,330	1,574	6,483
1950	900	31	4,826	1,895	7,652
1951	483	216	6,825	1,725	9,249
1952	9,467	126	9,813	2,695	22,101
1953	7,692	237	11,494	3,245	22,668
1954					
Jan.	618	0	434	295	1,347
Feb.	508	2	1,251	287	2,048
Mar.	1,265	416	930	288	2,899
Apr.	520	62	1,296	454	2,332
May	1,115	373	844	395	2,727
June	881	216	694	215	2,006
July	1,126	421	1,220	358	3,125
Aug.	1,314	384	945	307	2,950
Sept.	785	53	978	270	2,086
Oct.	1,284	189	1,301	455	3,229
Nov.	659	575	1,081	435	2,750
Dec.	994	140	1,088	396	2,618
Total	11,069	2,831	12,062	4,155	30,117
1955					
Jan.	1,381	716	1,046	194	3,337
Feb.	1,331	370	1,049	259	3,009
Mar.	2,162	672	1,287	236	4,357
Apr.	1,807	1,562	1,636	506	5,511
May	3,500	376	1,430	357	5,663
June	6,030	726	1,541	389	8,686
July	5,212	870	1,275	472	7,829
Aug.	7,727	837	1,454	386	9,567
Sept.	8,598	526	1,946	602	11,672
Oct.	7,888	1,041	1,748	444	11,121
Nov.*	8,243	784	1,847	523	11,397

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1945	3,886	14,500	6,800	....	21,300	25,186
1946	5,714	23,500	13,000	....	36,500	42,214
1947	13,909	22,500	6,500	....	29,000	42,909
1948	28,489	21,500	5,250	....	26,750	55,239
1949	36,117	21,500	3,750	....	25,250	61,367
1950	56,138	31,000	5,500	....	36,500	92,638
1951	46,750	31,031	6,279	2,628	39,938	86,688
1952	53,567	40,562	7,368	3,093	51,023	104,590
1953	67,375	46,473	7,981	3,654	58,108	125,483
1954						
Jan.	5,882	3,475	615	275	4,365	10,247
Feb.	5,595	3,568	575	250	4,393	9,988
Mar.	6,610	3,982	729	335	5,046	11,656
Apr.	5,892	3,748	603	324	4,675	10,567
May	5,969	3,394	586	348	4,328	10,297
June	5,884	3,653	629	402	4,684	10,568
July	4,298	2,587	482	296	3,365	7,663
Aug.	5,228	2,834	561	351	3,746	8,974
Sept.	6,903	3,599	628	379	4,606	11,509
Oct.	7,527	4,347	612	376	5,335	12,862
Nov.	7,622	4,411	631	411	5,453	13,075
Dec.	7,671	4,575	600	460	5,635	13,306
Yr.-end adj.	+350	....	....	+300	....	....
Total	75,931	44,173	7,251	4,507	55,931	131,862
1955						
Jan.	7,355	4,537	661	506	5,704	13,059
Feb.	7,066	4,881	689	501	6,071	13,137
Mar.	8,415	5,861	828	509	7,198	15,613
Apr.	7,732	5,209	748	651	6,608	14,340
May	6,643	4,278	768	593	6,089	12,732
June	6,589	4,885	722	887	6,494	13,083
July	5,469	3,830	535	626	4,991	10,460
Aug.	6,784	4,514	770	810	6,094	12,878
Sept.	7,452	5,505	730	878	7,113	14,565
Oct.	7,209	5,704	739	611	7,054	14,263
Nov.*	6,593	6,051	867	591	7,509	14,102

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954						
Jan.	2,884	3,892	58	6,834	5,395	10,107
Feb.	2,636	2,908	74	5,617	5,896	10,448
Mar.	3,165	2,774	74	6,013	6,399	10,869
Apr.	3,134	2,770	97	6,001	6,266	11,234
May	3,017	2,900	84	6,002	5,909	11,170
June	2,889	3,657	85	6,631	5,739	10,379
July	2,707	3,471	87	6,265	4,132	8,429
Aug.	2,174	3,504	69	5,747	3,773	6,588
Sept.	1,130	2,839	64	4,033	4,489	7,179
Oct.	429	2,566	92	3,087	3,953	8,313
Nov.	449	2,142	90	2,681	3,245	8,706
Dec.	476	2,019	74	2,569	3,201	9,299
Total	25,090	35,442	948	61,480	58,397	
1955						
Jan.	413	3,629	74	4,116	3,089	8,252
Feb.	352	2,430	80	2,862	2,850	8,243
Mar.	491	2,732	105	3,328	3,234	8,217
Apr.	530	2,635	85	3,250	2,836	7,963
May	531	2,617	85	3,233	3,005	7,735
June	477	3,003	85	3,565	3,136	7,326
July	475	2,915	60	3,450	2,768	6,664
Aug.	394	3,274	65	3,733	2,923	5,917
Sept.	360	2,814	86	3,261	3,169	5,966
Oct.	319	2,595	89	3,004	3,119	6,286
Nov.	355	2,427	93	2,875	3,052	6,734

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Rubber Industry Sales and Inventories

(Million of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1952	1953	1954	1955	1952	1953	1954	1955
Jan.	408	424	348	405	809	866	844	798
Feb.	402	435	351	440	842	868	857	782
Mar.	400	473	388	466	857	880	849	805
Apr.	407	444	375	445	850	874	812	784
May	402	422	357	465	855	888	810	810
June	409	436	377	465	851	914	829	850
July	377	448	374	471	890	925	784	853
Aug.	388	409	337	456	877	897	761	863
Sept.	427	416	334	456	871	908	804	874
Oct.	423	395	332	428	866	881	838	915
Nov.	383	346	388	....	850	867	819	...
Dec.	418	369	407	....	877	868	929	...
Total	4,844	5,017	4,368	....	Av. 858	853	831	...

Source: Office of Business Economics, U. S. Department of Commerce.
* Adjusted for seasonal variation.

1954 Chemical Usage in GR-S Production*

(Long Tons)

S-Type	Polymerization Emulsifiers	Stabilizers	Processing Oil	Carbon Black
Dry:				
Hot	5,934	1,312	....	....
Black	238	63	....	2,098
Cold	8,279	1,531	....	....
Black	2,157	482	....	16,066
Oil	7,028	1,316	36,308	....
Black	881	198	3,465	6,690
Total Dry	24,517	4,902	39,773	24,854
Latex:				
Hot	1,410	....	....	....
Cold	941	....	....	....
Total Latex	2,351	....	....	....
TOTAL S-TYPE	26,868	4,902	39,773	24,854

Source: "Industry Report—Chemical and Rubber," Dec., 1955, p. 30.
* Chemical usage for a small quantity of short-run S-type is omitted because of lack of data.

SITUATIONS OPEN (Continued)

TECHNICAL MAN WANTED WITH KNOWLEDGE OF RUBBER and vinyl coating. Send experiences. Address Box No. 1877, care of RUBBER WORLD.

SALES TRAINEE

Young man to work as sales trainee out of Toronto office for AAA-1 American company. Plastic sales experience helpful. Furnish résumé showing experience, education, salary requirements, etc. Address Box No. 1879, care of RUBBER WORLD.

RUBBER CHEMIST, SOME EXPERIENCE WITH DEVELOPMENT and processing Rubber Compounds used in manufacture of Printers' Rollers desirable. Excellent opportunity with Canadian manufacturer. Give full particulars including education, experience, and salary requirements. Address Box No. 1880, care of RUBBER WORLD.

SITUATIONS WANTED

TECHNICAL SALES SERVICE ENGINEER OR CHIEF ENGINEER. Twelve years' Rubber and Plastics, trouble shooting, installation, intimate technical knowledge of Internal Mixers, Mills, Calenders, Extruders, Presses, Tire Plant, Plastics Extrusion, Design of special Equipment. English, resident of Canada, present territory Canada and States, good connections Europe and North America, anywhere in World. Address Box No. 1872, care of RUBBER WORLD.

LATEX CHEMIST—CHEMICAL ENGINEER

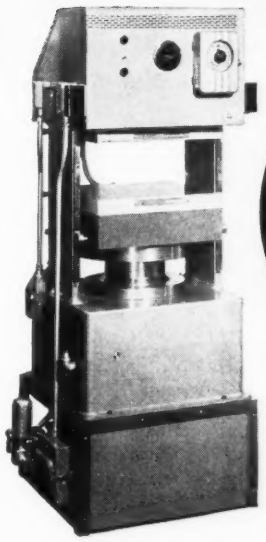
Textile and paper coatings, paper saturation, and adhesives. 18 years' experience in synthetic and natural latex and resin emulsion fields. Married; family. B.S. Chem. Eng. Reg. Prof. Eng. New England preferred. Address Box No. 1873, care of RUBBER WORLD.

VINYL CHEMIST, NOW EMPLOYED, EXPERIENCED IN formulating and evaluating vinyl resins, plasticizers, stabilizers, etc. Address Box No. 1875, care of RUBBER WORLD.

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: DOUBLE-ARM SIGMA-BLADE JACKETED MIXERS: (4) Read 50-gal., 30 hp; (2) W & P 100-gal. Kux model 25 rotary pellet presses, 21 and 25 punch. (9) Devine Vacuum Shelf Dryers #17, #23, #27. WE BUY SURPLUS EQUIPMENT. PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila, 22, Pa.

The **P·H·I** *Automatic 70 Ton Hydraulic Press*



ELECTRIC
Hydraulic System,
Cycle Timer,
Heated Platens and
Temperature controls

18"x 18" Platens to 600°
with thermoswitch controls.
Two position ram gives
8"& 12" Daylight.
8" stroke with down stroke trip.

larger presses built to customers specifications

P·H·I PRESS

Write for Circular
PASADENA HYDRAULICS INC.
279 N. Hill Avenue
Pasadena 4, California

STEEL CALENDER STOCK SHELLS

ALL STEEL, ALL WELDED CONSTRUCTION, with forged steel hubs for 1¼", 1½" and 2" square bars. 4", 5", 6", 8", 10", 12", 15", 20" and 24" diameters. Any length. Also Special Trucks (Leaf Type) Racks, Tables and Jigs.

Used in manufacturing rubber and plastic products.

THE W. F. GAMMETER COMPANY
CADIZ, OHIO

RUBBER HARDNESS
ORIGINAL SHORE
DUROMETER
A-2 SCALE
(A.S.T.M. D676)
VARIOUS OTHER MODELS FOR TESTING THE ENTIRE RANGE
TECHNICAL DATA ON REQUEST

THE SHORE INSTRUMENT & MFG. CO. INC.
90-35 VAN WYCK EXPRESSWAY
JAMAICA 35, N.Y.

NEW and REBUILT MACHINERY
Since 1891
L. ALBERT & SON
Trenton, N. J., Akron, Ohio, Chicago, Ill., Los Angeles, Calif.

GUARANTEED REBUILT MACHINERY
IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
UNITED
HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya Estate	Malaya Native	Indonesia Estate	Indonesia Native	All Other	Total
1947	360.5	285.8	12.8	265.2	335.7	1,260.0
1948	403.6	294.6	101.7	330.6	394.5	1,525.0
1949	400.8	270.7	169.1	263.9	385.5	1,490.0
1950	376.7	317.4	175.1	521.4	469.4	1,860.0
1951	328.8	276.5	222.5	591.9	465.3	1,885.0
1952	341.7	242.5	293.2	456.0	456.6	1,790.0
1953	341.8	232.6	301.8	390.4	458.4	1,725.0
1954						
Jan.	30.3	19.1	24.2	34.9	44.0	152.5
Feb.	25.4	18.0	23.0	30.2	30.9	127.5
Mar.	24.6	17.5	23.2	36.7	35.5	137.5
Apr.	24.8	15.4	21.2	37.0	34.1	132.5
May	27.6	18.6	22.9	32.9	30.5	132.5
June	27.0	16.3	21.0	33.5	39.7	137.5
July	31.0	23.0	26.8	46.2	38.0	165.0
Aug.	30.9	21.6	21.9	37.1	38.5	150.0
Sept.	30.1	23.4	23.6	46.4	41.5	165.0
Oct.	29.5	20.8	23.9	45.6	40.2	160.0
Nov.	31.9	22.9	24.3	36.8	46.6	162.5
Dec.	30.4	24.2	24.5	47.0	53.9	180.0
Total	343.5	240.8	280.5	464.3	473.4	1,802.5
1955*						
Jan.	29.3	27.9	23.6	17.1	42.1	140.0
Feb.	28.5	20.4	22.3	48.3	38.0	157.5
Mar.	27.5	26.7	23.0	24.3	38.5	140.0
Apr.	24.2	20.5	20.7	27.5	42.1	135.0
May	27.4	22.4	18.0	29.9	37.3	135.0
June	27.6	22.9	21.3	52.8	40.4	165.0
July	30.3	25.7	21.2	32.5	55.3	165.0
Aug.	30.7	23.6	20.0	43.2	37.5	155.0
Sept.	31.3	24.9	20.3	45.2	45.8	167.5
Oct.	30.8	24.0	22.0	44.8	48.4	170.0

Source: BDSA, United States Department of Commerce; Secretariat of the International Rubber Study Group; and United Baltic Corp., Ltd.
* Some figures revised.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany*	Total
1945	820.4	45.8	....	866.1
1946	740.0	51.0	5.6	806.6
1947	508.7	42.4	8.2	559.3
1948	488.3	40.5	3.4	532.2
1949	393.7	46.6	....	440.3
1950	476.2	58.4	....	534.6
1951	845.2	62.3	0.9	908.4
1952	798.6	74.3	4.9	877.8
1953	848.4	80.9	6.3	935.6
1954				
Jan.	57.3	7.3	0.4	65.0
Feb.	53.4	6.7	0.4	60.5
Mar.	55.8	7.4	0.5	63.7
Apr.	47.6	7.1	0.6	55.3
May	46.6	7.3	0.5	54.4
June	45.9	5.9	0.5	52.3
July	47.0	5.8	0.5	53.3
Aug.	48.8	7.3	0.7	56.8
Sept.	51.4	7.9	0.6	59.9
Oct.	55.6	8.0	0.6	64.2
Nov.	55.0	8.0	0.7	63.7
Dec.	58.5	7.9	0.9	67.3
Total	622.9	86.6	6.9	716.4
1955				
Jan.	69.9	8.1	0.9	78.9
Feb.	67.7	7.6	0.9	76.2
Mar.	78.5	8.7	0.8	88.0
Apr.	75.7	7.6	0.8	84.1
May	82.0	8.9	0.9	91.7
June	78.2	8.6	0.9	87.7
July	81.9	8.2	0.9	91.0
Aug.	84.0	8.1	1.0	93.1
Sept.	83.5	9.3	0.9	93.7
Oct.	88.1	9.9	....	....

Source: Secretariat of the International Rubber Study Group; and BDSA, United States Department of Commerce.
* British Zone only from 1945 to 1947; Bizone for 1948 and 1949; Federal Republic since 1950.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	U.S.S.R.* and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1947	562.7	57.2	153.6	336.5	547.3	1,100.0
1948	627.3	121.0	193.7	480.5	795.2	1,422.5
1949	574.5	132.5	184.3	546.2	863.0	1,437.5
1950	720.3	152.5	219.7	612.5	984.7	1,705.0
1951	454.0	136.3	234.2	675.5	1,046.0	1,500.0
1952	453.8	146.8	197.3	652.1	996.2	1,450.0
1953	553.5	101.9	206.6	753.0	1,061.5	1,615.0
1954						
Jan.	47.0	7.8	20.3	67.4	95.5	142.5
Feb.	46.9	....	17.5	70.6	88.1	135.0
Mar.	53.7	2.7	19.1	72.0	93.8	147.5
Apr.	51.4	15.5	19.7	68.4	103.6	155.0
May	51.4	1.1	18.8	66.2	86.1	137.5
June	54.2	3.6	18.0	64.1	85.7	140.0
July	37.9	0.8	17.7	68.6	87.1	125.0
Aug.	38.1	8.9	14.2	63.8	86.9	125.0
Sept.	52.4	11.5	19.3	71.8	102.6	155.0
Oct.	56.0	3.5	23.1	74.9	101.5	157.5
Nov.	53.3	2.3	19.2	75.2	96.7	150.0
Dec.	55.2	5.0	19.6	72.7	97.3	152.5
Total	597.5	62.7	226.5	835.7	1,124.9	1,725.0
1955						
Jan.	56.9	7.8	22.7	72.9	103.4	160.0
Feb.	51.0	....	19.5	....	91.5	142.5
Mar	58.5	7.3	20.8	78.1	104.6	162.5
Apr.	53.0	....	23.3	....	104.6	160.0
May	54.7	....	20.5	....	105.3	160.0
June	56.3	2.8	18.3	82.6	103.7	160.0
July	46.2	1.8	18.3	76.2	96.3	142.5
Aug.	48.4	0.1	16.0	78.0	94.1	142.5
Sept.	51.0	2.1	19.8	74.6	96.5	147.5
Oct.	55.2	10.4	22.9	73.8	107.3	162.5

Source: BDSA, United States Department of Commerce; Secretariat of the International Rubber Study Group; and United Baltic Corp., Ltd.
* Estimated.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1945	693.6	35.9	63.8	55.0	865.0
1946	761.7	29.6	30.1	75.0	912.5
1947	559.7	29.2	2.8	32.5	625.0
1948	442.1	20.6	2.6	15.0	480.0
1949	414.4	18.1	2.4	14.0	450.0
1950	538.3	22.6	2.8	16.0	580.0
1951	758.9	26.4	3.9	22.3	812.5
1952	807.0	33.6	4.9	35.0	885.0
1953	784.8	35.9	4.9	39.3	872.5
1954					
Jan.	50.2	2.6	0.6	3.8	57.5
Feb.	49.1	3.0	0.5	4.0	57.5
Mar.	56.1	2.9	0.7	4.3	65.0
Apr.	53.6	2.7	0.8	4.0	62.5
May	52.6	2.7	0.7	4.0	60.0
June	57.2	2.8	0.7	4.3	67.5
July	41.5	1.9	0.6	4.3	50.0
Aug.	42.1	2.0	0.7	3.5	47.5
Sept.	53.9	2.4	0.8	4.5	62.5
Oct.	58.3	2.1	1.0	4.3	67.5
Nov.	57.3	2.6	0.8	4.5	65.0
Dec.	64.1	2.4	0.8	4.5	72.5
Total	636.7	30.1	8.7	50.8	740.0
1955					
Jan.	68.4	2.6	1.2	5.0	77.5
Feb.	67.6	3.1	1.1	5.0	77.5
Mar.	77.1	3.4	1.2	5.8	90.0
Apr.	72.1	3.0	1.5	5.8	85.0
May	75.7	3.3	1.4	6.3	87.5
June	80.2	3.8	1.5	6.8	95.0
July	63.3	2.7	1.4	6.8	75.0
Aug.	73.3	2.7	1.5	6.3	85.0
Sept.	76.7	3.7	1.9	7.3	92.5
Oct.	81.5	3.6	2.6	7.8	97.5

Source: Secretariat of the International Rubber Study Group; BDSA, United States Department of Commerce.
* Includes latices.
† Figures estimated or partly estimated.

MACHINERY AND SUPPLIES FOR SALE (Continued)

STOKES 150-TON SEMI-AUTOMATIC HYDRAULIC PRESS. Kux 2½"-dia. single-punch preform machine. Farrel 15" x 36" 2-roll rubber mill and sizes up to 84". New and used lab. 6" x 13" and 6" x 16" mills and calenders. Baker-Perkins Jacketed Mixers 100, 50, and 9 gals. Farrel 200-ton Hydr. Press 20" x 80" platens. Brunswick 225-ton 21" x 21" platens. 100-ton 20" x 20" platens. 150-ton 24" x 24" platens. Large stock hydraulic presses 12" x 12" to 48" x 48" platens. Hydraulic pumps and accumulators. Extruders. Rotary Cutters. Stokes Molding Presses. Single-Punch & Rotary Preform Machines. Banbury Mixers, Crushers, Churns, Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 107—8th St., Brooklyn 15, N. Y. STerling 8-1944.

FOR SALE: 1—NATIONAL-ERIE 8½" STRAINER; 1—6 x 12" 2-roll lab. Mill; 1—HPM Hydro-pneumatic accumulator 200-3100#; 2—24 x 24" hydraulic presses 18" ram; also calenders, mixers, vulcanizers, etc. CHEMICAL & PROCESS MACHINERY CORP., 52 Ninth Street, Brooklyn 15, N. Y.

DON'T PLACE THAT ORDER YET! YOU OWE IT TO YOURSELF to get FMC's quotations on Mills, Calenders, Tubers, Extruders, Cutters, Double-Arm Mixers, Vulcanizers, and Presses. Liberal Trade-Ins on YOUR equipment . . . send us your surplus list. FIRST MACHINERY CORP., 209-289 Tenth St., Brooklyn 15, N. Y. STerling 8-4672.

FOR SALE: 1—BALL & JEWELL ROTARY CUTTER, SIZE O, m.d.; 1—8" x 16" 2-roll mill, m.d.; 1—Colton #5½ single-punch tablet machines, m.d.; 1—6" x 12" laboratory mill m.d.; also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. WANTED: Your Surplus Rubber Machinery. CONSOLIDATED PRODUCTS CO., INC., 64 Bloomfield St., Hoboken, N. J.: HOboken 3-4425; N. Y. Phone: BArclay 7-0600.

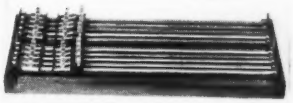
FOR SALE: SOLVENT VAPOR RECOVERY SYSTEM, AUTOmatically operated, capacity 800 lbs. per hour. Formerly used for recovery of Toluene and other hydrocarbons from rubber solution coating operation. Available for immediate installation. PROCESS EQUIPMENT CORP., 18222 James Couzens, Detroit 35, Mich. TExas 4-6532.

The Classified Ad Columns of RUBBER WORLD bring prompt results at low cost.

HOWE MACHINERY CO., INC.
30 GREGORY AVENUE PASSAIC, N. J.
Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT
Call or write.

TESTED IS TRUSTED

PERMANENT SET TEST EQUIPMENT
For Cold Tension Recovery Test
fulfilling Specification MIL-C 12064(CE).



This equipment is also a must to adequately control the production of compounds intended for wire coverings, rubber belting and tire carcasses.

SCOTT TESTERS *Trademark

SCOTT TESTERS, INC.
90 Blackstone St., Providence, R. I.

MOLDS
WE SPECIALIZE IN MOLDS FOR
Heels, Soles, Slabs, Mats, Tiling and Mechanical Goods
MANUFACTURED FROM SELECTED HIGH GRADE STEEL BY TRAINED CRAFTSMEN, INSURING ACCURACY AND FINISH TO YOUR SPECIFICATIONS. PROMPT SERVICE.
L. C. WADE CO., INC.
79 BENNETT ST. LYNN, MASS.

CUTTING—RUBBER—SOLES
NEW WELLMAN MACHINE
UNVULCANIZED RUBBER OR PLASTIC
BEVEL OR STRAIGHT EDGE
CUT PRECISION SOLES UP TO 1" THICK
WELLMAN CO., MEDFORD, MASS., U. S. A.

"ANNALS OF RUBBER"
A Chronological Record of the Important Events in the History of Rubber
50c. per copy—
RUBBER WORLD
386 FOURTH AVENUE
NEW YORK 16, N. Y.

FLEXO JOINTS

THE STANDARD FOR SAFETY

• Proved in years of efficient service, FLEXO JOINTS offer the flexibility of hose — the strength of pipe — the ideal steam connection for presses, tire molds, etc.
Four styles, for standard pipe sizes ¼" to 3".
• Write for information and prices.

FLEXO SUPPLY CO., INC., 4651 Page Blvd., St. Louis 13, Mo. *In Canada:* S. A. ARMSTRONG, LTD. 1400 O'Connor Dr., Toronto 13, Ontario

AKRON RUBBER MACHINERY CO., INC.
200 S. Forge St. AKRON 9, OHIO Phone HE 4-9141
"ARMACO"
We are one of the foremost specialists in supplying used, reconditioned, and new machinery for the Rubber and Plastic industries only. NEW—Laboratory mills, hydraulic presses, extruders, bale cutters, and vulcanizers. We are interested in purchasing your surplus machinery or complete plant.
"ARMACO"

U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
Passenger Car						
1953	33,106	45,798	809	79,713	81,455	13,044
1954						
Jan. ..	2,549	3,378	59	5,986	5,251	12,279
Feb. ..	2,323	3,001	60	5,384	5,952	12,832
Mar. ..	2,809	3,753	45	6,607	6,878	13,112
Apr. ..	2,785	4,328	95	7,208	7,031	12,955
May ..	2,695	4,503	101	7,300	6,985	12,575
June ..	2,587	5,326	89	8,002	7,755	12,323
July ..	2,516	5,222	73	7,812	5,605	10,063
Aug. ..	2,283	4,605	73	6,961	4,709	7,797
Sept. ..	1,375	3,825	73	5,273	6,242	8,950
Oct. ..	1,617	3,422	81	5,120	6,702	10,531
Nov. ..	2,823	2,844	91	5,758	6,480	11,331
Dec. ..	3,383	2,845	87	6,315	7,215	12,228
Total	29,746	47,043	928	77,717	76,806	
1955						
Jan. ..	3,481	4,139	79	7,699	7,797	12,363
Feb. ..	3,540	3,551	83	7,174	7,549	12,643
Mar. ..	4,326	4,255	104	8,685	8,810	12,874
Apr. ..	3,967	4,677	88	8,733	8,000	12,197
May ..	3,871	4,705	87	8,663	8,742	12,235
June ..	3,482	5,399	97	8,979	9,383	12,698
July ..	3,461	4,802	76	8,339	7,893	12,199
Aug. ..	2,984	5,058	60	8,103	7,585	11,636
Sept. ..	2,749	4,366	74	7,189	7,882	12,407
Oct. ..	3,172	3,556	74	6,802	8,160	13,806
Nov. ..	3,900	2,902	63	6,865	8,198	15,142
Truck and Bus						
1953	4,843	9,326	734	14,904	14,696	2,676
1954						
Jan. ..	342	615	59	1,016	1,048	2,698
Feb. ..	311	556	57	924	1,089	2,877
Mar. ..	354	597	71	1,022	1,103	2,966
Apr. ..	346	607	81	1,035	1,034	2,951
May ..	324	612	83	1,020	980	2,928
June ..	303	703	71	1,076	1,041	2,895
July ..	265	725	82	1,073	755	2,577
Aug. ..	243	824	51	1,118	717	2,188
Sept. ..	227	711	57	995	1,037	2,233
Oct. ..	251	828	66	1,145	1,167	2,268
Nov. ..	301	716	67	1,084	1,145	2,345
Dec. ..	325	625	81	1,031	1,229	2,546
Total	3,592	8,111	826	12,529	12,347	
1955						
Jan. ..	303	827	81	1,211	1,243	2,586
Feb. ..	294	730	74	1,098	1,196	2,678
Mar. ..	454	672	96	1,222	1,273	2,734
Apr. ..	489	639	76	1,204	1,153	2,693
May ..	481	655	65	1,202	1,208	2,701
June ..	449	730	76	1,255	1,320	2,763
July ..	429	909	51	1,389	1,134	2,485
Aug. ..	378	922	59	1,359	1,132	2,272
Sept. ..	393	804	66	1,264	1,243	2,268
Oct. ..	324	904	88	1,315	1,395	2,357
Nov. ..	403	690	87	1,180	1,405	2,584
Total Automotive						
1953	37,949	55,124	1,543	94,617	96,150	15,720
1954						
Jan. ..	2,891	3,993	118	7,002	6,299	14,977
Feb. ..	2,634	3,557	117	6,308	7,042	15,709
Mar. ..	3,163	4,350	116	7,629	7,981	16,077
Apr. ..	3,131	4,935	176	8,243	8,065	15,906
May ..	3,020	5,115	184	8,319	7,965	15,504
June ..	2,890	6,029	160	9,079	8,796	15,218
July ..	2,782	5,948	155	8,884	6,360	12,640
Aug. ..	2,527	5,429	123	8,079	5,427	9,985
Sept. ..	1,602	4,537	130	6,269	7,279	11,184
Oct. ..	1,868	4,251	147	6,266	7,869	12,799
Nov. ..	3,124	3,560	158	6,842	7,626	13,676
Dec. ..	3,707	3,470	169	7,346	8,444	14,774
Total	33,338	55,154	1,754	90,246	89,153	
1955						
Jan. ..	3,785	4,967	159	8,911	9,040	14,949
Feb. ..	3,833	4,281	157	8,272	8,745	15,321
Mar. ..	4,780	4,926	201	9,907	10,083	15,609
Apr. ..	4,457	5,315	165	9,937	9,153	14,890
May ..	4,352	5,361	152	9,865	9,949	14,936
June ..	3,931	6,129	174	10,234	10,703	15,460
July ..	3,890	5,711	128	9,729	9,027	14,684
Aug. ..	3,362	5,980	119	9,462	8,717	13,908
Sept. ..	3,142	5,171	140	8,453	9,125	14,675
Oct. ..	3,495	4,460	161	8,117	9,555	16,163
Nov. ..	4,303	3,592	150	8,045	9,603	17,727

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumers Price Index
		All Rubber Products			
1939	121	$27.84	39.9	$0.75	....
1952	212	74.48	40.7	1.83	113.5
1953	221	77.78	40.3	1.93	114.4
1954					
July	173.1	76.83	39.4	1.95	115.2
Aug.	177.0	76.25	39.1	1.95	115.0
Sept.	198.9	77.81	39.3	1.98	114.7
Oct.	204.2	81.20	40.4	2.01	114.5
Nov.	204.6	83.02	41.1	2.02	114.6
Dec.	209.3	85.07	41.7	2.04	114.3
1955					
Jan.	210.5	84.25	41.3	2.04	114.3
Feb.	210.4	84.25	41.3	2.04	114.3
Mar.	211.2	83.44	40.9	2.04	114.3
Apr.	211.6	86.11	41.8	2.06	114.2
May	214.4	86.94	41.8	2.08	114.2
June	220.0	88.83	42.3	2.10	114.4
July	216.9	86.52	41.2	2.10	114.7
Aug.	219.0	86.32	41.3	2.09	114.5
Sept.	223.1	87.57	41.7	2.10	114.9
Oct.	225.3	....	....	....	114.9
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1952	92.9	85.65	40.4	2.12	
1953	93.0	88.31	39.6	2.23	
1954					
July	67.3	87.01	38.5	2.26	
Aug.	68.0	85.65	37.4	2.29	
Sept.	85.2	86.18	38.3	2.25	
Oct.	86.5	90.39	39.3	2.30	
Nov.	83.7	94.54	40.4	2.34	
Dec.	87.0	98.18	41.6	2.36	
1955					
Jan.	87.6	97.41	41.1	2.37	
Feb.	86.5	96.46	40.7	2.37	
Mar.	87.4	95.27	40.2	2.37	
Apr.	88.4	101.28	42.2	2.40	
May	90.1	100.91	41.7	2.42	
June	91.0	105.60	43.1	2.45	
July	91.5	103.82	42.9	2.42	
Aug.	91.0	102.72	42.1	2.44	
Sept.	92.4	103.39	42.2	2.45	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1952	22.9	62.22	40.4	1.54	
1953	23.7	65.60	40.0	1.64	
1954					
July	20.1	68.45	40.5	1.69	
Aug.	20.5	66.40	40.0	1.66	
Sept.	21.0	66.08	39.1	1.69	
Oct.	21.9	71.34	41.0	1.74	
Nov.	22.3	71.51	41.1	1.74	
Dec.	22.3	71.69	41.2	1.74	
1955					
Jan.	22.1	68.97	40.1	1.72	
Feb.	21.5	69.72	40.3	1.73	
Mar.	21.4	69.72	40.3	1.73	
Apr.	21.2	70.99	40.8	1.74	
May	21.4	70.64	40.6	1.74	
June	21.6	71.34	41.0	1.74	
July	21.8	71.93	41.1	1.75	
Aug.	21.5	67.25	39.1	1.72	
Sept.	23.5	67.60	39.3	1.72	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1952	96.0	66.58	41.1	1.62	
1953	104.1	70.93	41.0	1.73	
1954					
July	85.7	70.62	39.9	1.77	
Aug.	88.5	71.15	40.2	1.77	
Sept.	92.7	72.36	40.2	1.80	
Oct.	95.8	74.98	41.2	1.82	
Nov.	98.6	75.71	41.6	1.82	
Dec.	100.0	76.44	42.0	1.82	
1955					
Jan.	100.8	76.08	41.8	1.82	
Feb.	101.4	76.86	42.0	1.83	
Mar.	102.4	76.13	41.6	1.83	
Apr.	101.1	76.13	41.6	1.83	
May	105.0	78.31	42.1	1.86	
June	106.4	77.93	41.9	1.86	
July	103.6	73.84	39.7	1.86	
Aug.	104.3	75.85	41.0	1.85	
Sept.	107.2	78.58	41.8	1.88	

Source: BLS, United States Department of Labor.

MACHINERY & SUPPLIES WANTED

WANTED: RUBBER MACHINERY INCLUDING BANBURY Mixers, heavy-duty Mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a now-operating or shut-down plant. P. O. Box 1351, Church Street Sta., New York 8, N. Y.

WANTED: #3 (4½" BORE) SPIROD QUADRUPLE-EXTENDED cylinder, electrically heated extruder, complete with cabinet-type panel board, evaporative cooling unit, D. C. motor and control. Address Box No. 1876, care of RUBBER WORLD.

BUSINESS OPPORTUNITIES

WE CAN DELIVER

TITANIUM DIOXIDE

ANATASE AND RUTILE GRADES

IF YOU ARE IN SHORT SUPPLY, WE CAN TAKE CARE OF YOUR IMMEDIATE NEEDS

WIRE OR PHONE FOR PRICES

BARCLAY CHEMICAL COMPANY
INCORPORATED
75 Varick Street, New York 13, N. Y.
Telephone: WOrth 4-5120

FOR SALE

MOTOR & BICYCLE TYRES & TUBES MANUFACTURING PLANT:

Situated in the State of Selangor, Federation of Malaya. Total site about 15 acres with 80,000 square feet covered area. Completely installed with modern U.K. & U.S. machineries. Daily production capacity motor car and truck tyres and tubes more than 1,000 pieces and bicycle tyres and tubes more than 10,000 pieces. Good opportunity for sound investment in a new enterprise. Please address communications to P. O. Box No. 100, KUALA LUMPUR, Federation of Malaya.

Custom Mixing RUBBER-PLASTICS

We do milling and compounding of all types—black or color—master batches

All mixing done under careful supervision and laboratory control.

Phone: Butler 9-0400

Pequanoc Rubber Co.
MANUFACTURERS OF RECLAIMED RUBBER
MAIN SALES OFFICE and FACTORY, BUTLER, N. J.

NEOPRENE and RUBBER coating of metal parts

By Dipping or Spraying. Springs, Clamps, Brackets, Handles, Hooks, Tubes, Rollers, Wire Forms, Filter Plates, Fans, Screens, Impellers, Housings, Ducts, etc.

NEOPRENE or RUBBER bellows, boots and sleeves

Convoluted boots, tubes, sleeves and bellows. Covers, Sacs, Caps, grommets. Many standard sizes available.

Specialists in the manufacture of custom parts by the anode-latex-dip process. (Low cost molds).

Send drawings for quotation

LATEX PRODUCTS, INC.
147 Van Winkle Avenue Hawthorne, New Jersey

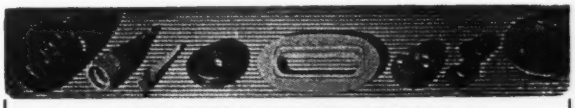
MANUFACTURING BUSINESS WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained. Address all replies "confidentially" C. J. GALE, Sec., P. O. Box 1351, Church St. Station, New York 8, N. Y.

MIXING

To Your Specification

K. B. C. INDUSTRIES, INC. NEW HAVEN, CONN.
881 State Street Tel: State 7-5662
Otto J. Lang, General Manager



INDUSTRIAL RUBBER GOODS
BLOWN — SOLID — SPONGE
FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER
THE BARR RUBBER PRODUCTS CO. SANDUSKY OHIO

SINCE 1880 RUBBER & PLASTIC
"They Last Longer" REG. U. S. PAT. OFF.

Rand REG. U. S. PAT. OFF.

DRESS SHIELDS
DRESS SHIELD LININGS
BABY PANTS
BABY BIBS & APRONS
SANITARY WEAR
RUBBERIZED SHEETING
RUBBER APRONS
STOCKINET SHEETS
RUBBER SHEETS
RAINCAPES & COATS
RUBBER SPECIALTIES
VINYL PLASTIC SHEETING
RUBBER DAM & BANDAGES — SHEET GUM

RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.

Carbon Black Statistics—First Eleven Months, 1955

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, semi-abrasion furnace black.

(Thousands of Pounds)

Production	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Furnace types											
Thermal	9,315	8,269	10,317	10,620	12,094	12,077	12,189	12,879	12,164	12,499	12,365
SRF	25,099	26,162	26,258	25,634	24,974	26,561	28,371	28,813	29,315	30,162	29,699
HMF	9,060	7,610	8,538	7,644	7,665	7,015	8,700	7,867	9,598	9,552	8,746
FEF	12,395	11,597	14,943	17,039	19,196	19,013	18,938	20,125	20,051	20,276	18,469
HAF	33,199	29,344	34,011	35,341	36,249	37,238	39,592	40,692	36,672	37,707	32,386
SAF	15,627	18,010	18,139	17,201	15,699	14,494	12,260	10,203	10,786	12,555	14,531
Total furnace	104,695	100,992	112,206	113,479	115,877	116,398	120,050	120,584	118,586	122,751	116,196
Contact types	29,693	27,153	30,750	31,676	30,559	30,238	30,466	30,141	29,717	30,724	30,797
Totals	134,388	128,145	142,956	145,155	146,436	146,636	150,516	150,725	148,303	153,475	146,993
Shipments											
Furnace types											
Thermal	8,209	9,756	11,957	10,659	12,150	12,426	11,490	11,121	11,986	12,663	12,295
SRF	26,411	26,851	27,654	28,722	27,508	27,808	26,742	25,394	28,124	28,146	29,425
HMF	8,318	8,399	10,089	8,834	9,129	9,532	8,288	8,241	8,818	9,242	8,508
FEF	15,737	16,801	19,144	18,139	18,641	17,068	16,179	17,103	17,954	19,603	19,967
HAF	32,602	32,373	35,163	34,764	35,505	35,548	33,872	36,865	34,161	36,861	38,060
SAF	14,069	13,754	15,431	15,721	15,108	14,491	14,160	11,625	14,375	15,251	16,474
Total furnace	105,346	107,934	119,438	116,839	118,041	116,873	110,731	110,349	115,418	121,766	124,729
Contact types	43,403	35,263	42,107	39,827	37,073	36,697	33,228	40,330	38,081	39,335	37,924
Totals	148,749	143,197	161,545	156,666	155,114	153,570	143,959	150,679	143,499	161,101	162,653
Producers' Stocks, End of Period											
Furnace types											
Thermal	6,513	5,026	3,386	3,347	3,291	2,942	3,641	5,399	5,577	5,413	5,483
SRF	16,466	15,777	14,381	11,293	8,759	7,512	9,141	12,560	13,751	15,767	16,041
HMF	25,004	24,215	22,664	21,474	20,010	17,493	17,905	17,531	18,311	18,621	18,859
FEF	23,204	18,000	13,799	12,699	13,254	15,199	17,958	20,980	23,077	23,750	22,252
HAF	28,579	25,550	24,398	24,975	25,719	27,409	33,129	36,956	39,467	40,313	34,639
SAF	28,340	32,596	35,304	36,784	37,375	37,378	35,478	34,061	30,472	27,776	25,833
Total furnace	128,106	121,164	113,932	110,572	108,408	107,933	117,252	127,487	130,655	131,640	123,107
Contact types	172,647	164,537	153,180	145,029	138,515	132,056	129,294	119,105	110,741	102,130	95,003
Totals	300,753	285,701	267,112	255,601	246,923	239,989	246,546	246,592	241,396	233,770	218,110
Exports											
Furnace types	18,318	21,137	23,392	22,234	21,165	20,805	20,413	19,985	20,728	19,282	....
Contact types	15,973	15,583	19,083	19,175	16,256	15,973	15,252	19,529	17,369	16,501	....
Totals	34,291	36,720	42,475	41,409	37,421	36,778	35,665	39,514	38,097	35,783	....

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

CALENDAR of COMING EVENTS

February 17

Chicago Rubber Group. Furniture Club, Chicago, Ill.

February 21

Elastomer & Plastics Group, Northeastern Section, ACS.

February 27-March 2

American Society for Testing Materials. Committee Week. Hotel Statler, Buffalo, N. Y.

March 6

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

March 15

Elastomer & Plastics Group, Northeastern Section, ACS. Symposium on Structure of Rubbers.

March 15-16

American Institute of Industrial Engineers, Inc. Cleveland Chapter. Fifth Annual Spring Conference.

March 15-17

Division of High-Polymer Physics, American Physical Society. Annual Meeting, Pittsburgh, Pa.

March 16

Chicago Rubber Group. Furniture Club, Chicago, Ill.

Boston Rubber Group. Spring Meeting. Hotel Somerset, Boston, Mass.

March 18-21

American Society of Mechanical Engineers. Spring Meeting. Multnomah Hotel, Portland, Oreg.

April 3

The Los Angeles Rubber Group, Inc.

April 3-9

International Symposium on Macromolecular Chemistry. The Weizmann Institute of Science, Rehovot, Israel.

April 6

Akron Rubber Group. Hotel Mayflower.

April 8-13

American Chemical Society. One Hundred Twenty-Ninth National Meeting. Dallas, Tex.

April 12

Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

April 13

Philadelphia Rubber Group, Inc. Poor Richard Club, Philadelphia, Pa.

April 17

Elastomer & Plastics Group, Northeastern Section, ACS.

April 27

Chicago Rubber Group. Furniture Club, Chicago, Ill.

May 1

The Los Angeles Rubber Group, Inc.

May 15

Elastomer & Plastics Group, Northeastern Section, ACS. Short Talks Symposium.

Index to Advertisers

This index is maintained for the convenience of our readers. It is not part of the advertisers' contract, and RUBBER WORLD assumes no responsibility to advertisers for its correctness.

A

Adamson United Co. 607
Aetna-Standard Engineering Co. ..... —
Akron Equipment Co., The ..... —
Akron Rubber Machinery Co., Inc., The 735
Albert, L., & Son 733
Alco Oil & Chemical Corp. 642
Aluminum Flake Co. 729
American Cyanamid Co., Rubber Chemicals Dept. 707
American Maintenance Supply Co. ..... —
American Resinous Chemicals Corp. ..... —
American Viscose Corp. ..... —
American Zinc Sales Co. ... Inside Back Cover
Ames, B. C., Co. 721
Angier Products, Inc. ..... —

B

Baker Castor Oil Co., The ..... —
Barclay Chemical Co. 737
Barco Manufacturing Co. ..... —
Barr Rubber Products Co., The 737
Black Rock Mfg. Co. ..... —
Bolling, Stewart, & Co., Inc. ..... —
Brockton Tool Co. ..... —
Brooklyn Color Works, Inc. 729
Burgess Pigment Co. 628

C

Cabot, Godfrey L., Inc. ..... 649, Back Cover
Carbide & Carbon Chemicals Co., A Division of Union Carbide & Carbon Corp. 621
Carter Bell Mfg. Co., The 714
Cary Chemicals, Inc. ..... —
Claremont Waste Mfg. Co. 721
CLASSIFIED ADVERTISEMENTS 731, 733, 735, 737
Cleveland Liner & Mfg. Co., The 645
Columbia-Southern Chemical Corp. 615
Columbian Carbon Co. Insert 675, 676
CONSULTANTS & ENGINEERS 722
Continental Carbon Co. 600, 601
Continental Machinery Co., Inc. 720

D

DPR, Incorporated, A Subsidiary of H. V. Hardman Co. 717
Darlington Chemicals, Inc. 718
Dayton Rubber Co., The 717
Diamond Alkali Co. 630
Dow Chemical Co., The ..... —
Dow Corning Corp. 701, 723
du Pont de Nemours, E. I., & Co. ..... Inside Front Cover, 629
Durez Plastics Division, Hooker Electrochemical Co. ..... —

E

Eagle-Picher Co., The 729
Emery Industries, Inc. 699
Enjay Co., Inc. 695
Erie Engine & Mfg. Co. 604
Erie Foundry Co. ..... —

F

Falls Engineering & Machine Co., The ..... —
Farrel-Birmingham Co., Inc. 627, 639
Ferry Machine Co. 719
Flexo Supply Co., The 735
French Oil Mill Machinery Co., The 598

G

Gale, C. J. 737
Gammeter, W. F., Co., The 733
General Latex & Chemical Corp. ..... —
General Tire & Rubber Co., The (Chemical Division) 610
Genseke Brothers 637
Gidley Laboratories, Inc. 722
Glidden Co., The (Chemicals, Pigments, Metals Division) 616, 617
Goodrich, B. F., Chemical Co. 593
Goodrich-Gulf Chemicals, Inc. 602
Goodyear Tire & Rubber Co., Inc., The (Chemical Division) 596, 597

H

Hale & Kullgren, Inc. 722
Hall, C. P., Co., The 614
Hanchett Manufacturing Co. 648
Harchem Division, Wallace & Tiernan, Inc. 632
Harwick Standard Chemical Co. 609
Heveatex Corp. 648
Hobbs Manufacturing Co. 715
Hoggson & Pettis Mfg. Co., The ..... —
Holliston Mills, Inc., The ..... —
Holmes, Stanley H., Co. ..... —
Home Rubber Co. 729
Howe Machinery Co., Inc. 735
Huber, J. M., Corp. 646

I

Indoil Chemical Co. 613
Industrial Ovens, Inc. 709
Institution of the Rubber Industry 716

J

Johnson Corp., The 718

K

K. B. C. Industries, Inc. 737

L

Lambert, E. P., Co. 644
Latex Products, Inc. 737
Liquid Carbonic Corp., The 705

M

Maimin, H., Co., Inc. ..... —
Marbon Chemical Division of Borg-Warner 605
McNeil Machine & Engineering Co., The ..... —
Merck & Co., Inc. (Marine Magnesium Division) 713
Miller-Stephenson Chemical Co., Inc. 712
Monsanto Chemical Co. (Plastics Division) 644
Monsanto Chemical Co. (Rubber Chemicals Dept.) ..... —
Morris, T. W., Trimming Machines ..... —
Muehlstein, H., & Co., Inc. 599

N

National Aniline Division, Allied Chemical & Dye Corp. 634, 635
National Rubber Machinery Co. ..... —
National-Standard Co. 608
Naugatuck Chemical Division of U. S. Rubber Co. 595, 641
Neville Chemical Co. 619
New Jersey Zinc Co., The 620
Nopco Chemical Co. 618

O

Oakite Products, Inc. ..... —
Osborn Manufacturing Co., The ..... —

P

Pan American Chemicals Corp. ..... —
Pasadena Hydraulics, Inc. 733
Paterson Parchment Paper Co. 711
Pennsylvania Industrial Chemical Corp. 611
Pequanoc Rubber Co. 737
Phillips Chemical Co. 594, 633
Polychemicals Division, West Virginia Pulp & Paper Co. 720
Polymel Corp., The 725
Pure Carbonic Co. ..... —
Pyroxylin Products, Inc. 712

R

Rand Rubber Co. 737
Rare Metal Products Co. ..... —
Richardson, Sid, Carbon Co. 740
Rotex Rubber Co. ..... —
Royle, John, & Sons 642
Rubber Corp. of America ..... —
Rubber Regenerating Co., Ltd., The 703

S

St. Joseph Lead Co. 636
Schlosser, H. A., & Co. 722, 729
Scott Testers, Inc. 735
Sharples Chemicals Division, Pennsylvania Salt Mfg. Co. ..... —
Shaw, Francis, & Co., Ltd. 612
Shell Chemical Corp., Synthetic Rubber Sales Division 631
Shore Instrument & Manufacturing Co., Inc., The 733
Siempelkamp, G., & Co. 697
Silicones Division, Union Carbide & Carbon Corp. 638
Skinner Engine Co., Rubber Machinery Division ..... —
Snell, Foster D., Inc. 722
South Texas Tire Test Fleet, Inc. ..... —
Southeastern Clay Co. ..... —
Southern Clays, Inc. 622
Spadone Machine Co., Inc. ..... —
Stamford Rubber Supply Co., The 640
Struthers Wells Corp. 624
Sturtevant Mill Co. ..... —
Sun Oil Co. 693
Synvar Corp. ..... —

T

Tapper, William 697
Taylor Instrument Cos. ..... —
Thiokol Chemical Corp. 643
Thomaston Mills 729
Timken Roller Bearing Co., The ..... —
Titanium Pigment Corp. ..... —

U

Union Carbide & Carbon Corp., Carbide & Carbon Chemicals Co. 621
Union Carbide & Carbon Corp., Silicones Division 638
United Carbon Co., Inc., Insert 625, 626
United Engineering & Foundry Co. 603
United Rubber Machinery Exchange 733
U. S. Rubber Reclaiming Co., Inc. ..... —

V

Vanderbilt, R. T., Co., Inc. 650
Velsicol Chemical Corp. 727

W

Wade, L. C., Co., Inc. 735
Wellington Sears Co. 606
Wellman Co. 735
Western Supplies Co. 710
Westinghouse Electric Corp., Sturtevant Division 708
White, J. J., Products Co. 640
Williams, C. K., & Co., Inc. ..... —
Witco Chemical Co. 600, 601
Woloch, George, Co., Inc. 719
Wood, R. D., Co. 623

...bad situation

Things are in a bad way if you suddenly realize your competition has gained advantage over you by lowering their material costs without decreasing quality. Now is the time to get in the saddle with Sid Richardson Carbon Co. and gain the benefits of ***TEXAS "E"*** and ***TEXAS "M"*** channel blacks. Used alone or in combination with other types of blacks they offer many savings.

TEXAS CHANNEL BLACKS are manufactured in the world's largest channel black plant with our own natural resources nearby, assuring continuing deliveries to fill our customers' requirements.

TEXAS
CHANNEL BLACKS
®

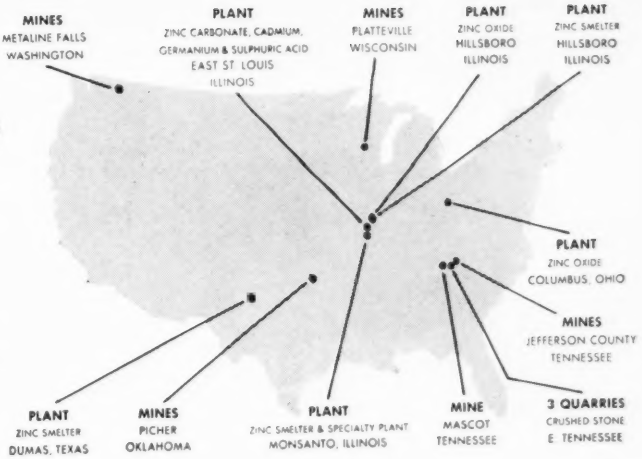
Sid Richardson
CARBON CO.

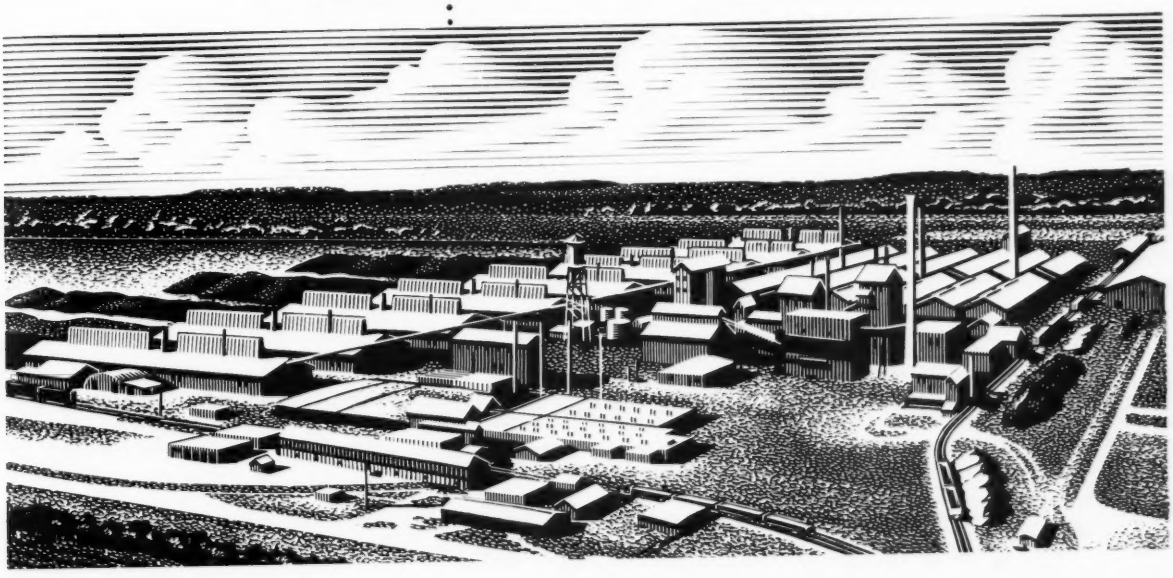
FORT WORTH, TEXAS

GENERAL SALES OFFICES
EVANS SAVINGS AND LOAN BUILDING
AKRON 8, OHIO

American Zinc and its products

from A *to* Z





SMELTER AT
DUMAS, TEXAS

Dumas is one of the larger horizontal retort furnace plants in the United States. Here are produced Prime Western, Select, Brass Special and Intermediate grades of slab zinc for the galvanizing and brass industries. Roasting and sintering operations are also carried on at Dumas, making this plant an important factor in the widespread American Zinc picture.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

throughout the world

NOW at Channel Black Prices....

VULCAN® 3

Best Quality HAF In the Industry

Vulcan 3 gives the same outstanding reinforcement, high abrasion resistance, excellent processing and good extrusion today that made it the top quality HAF black of the industry when it was introduced in 1949. For the best in HAF carbon blacks, rubber manufacturers continue to specify Cabot Vulcan 3 . . . now available for the first time at channel black prices throughout the world.

CABOT

GODFREY L. CABOT, INC.

77 FRANKLIN ST., BOSTON 10, MASS.